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The Standardization Work of the Detroit Edison Company

by

F. M. Price, *Editor*
Standards Catalog

Recognition of the need for standardization; what standardization involves; how the general aims of standardization are accomplished

The story of standardization in the Detroit Edison Company, beginning on the following pages, will be continued in the March and April issues.

I

Introduction

"Standardization" and "simplification" are terms which have come to be used rather frequently in the past decade by many individuals in the various branches of industry. To the layman the words probably indicate nothing more than repellingly technical references. However, to the engineers, purchasing agents, and other executives within each organization the words have gradually become synonymous with "savings" and "cost reduction."

Before this discussion becomes too deeply involved in attempting to tell what our conception of standardization is, how the need for it was recognized, how it is being accomplished, and what benefits are derived from it, a statement concerning the size of the company whose standardization program is being described might be apropos. Following is a brief statistical sketch of this company, the territory it serves, its properties, and the extent to which it traffics in materials.

The Detroit Edison Company, purchasing more than 65,000 different articles at a cost of over $20,000,000 annually, has placed both the purchase and utilization of its supplies on a scientific basis by means of a thoroughgoing program of standardization. For the benefit of the readers of the ASA BULLETIN, Mr. F. M. Price has written the description of the Detroit Edison Company's standardization work, beginning in this issue of the ASA BULLETIN. In the second section of Mr. Price's article, in the March issue, the administrative set-up for the work will be described. The concluding section, in the April issue, will tell of the benefits resulting from the work.

The Detroit Edison Company

The Detroit Edison Company, operating in Detroit and southeastern Michigan, does the entire commercial electric lighting and industrial power business in 23 cities, 64 incorporated villages, 115 unincorporated communities, and the rural areas of ten counties. The outer territory is tributary to Detroit and is all served by one interconnecting system of transmission lines. The total population in the area of 4408 square miles which the company serves is in the neighborhood of 2,280,000. Electric service is provided for approximately 550,000 customers.

The company does a large steam-heating business in the city of Detroit and supplies gas for industrial and residential purposes in four cities and seven villages.

The total assets of the company approximate $305,000,000.

The company operates four large steam-electric generating stations with a combined capacity of 837,000 kilowatts, seven small hydro-electric plants, and 160 electric substations, together with the necessary transmission and distribution lines. Other properties of the company include four boiler plants in downtown Detroit which supply steam for heating purposes to approximately 1800 customers and a gas plant supplying gas service to nearly 12,000 customers in Port Huron and in towns along the St. Clair River.

Purchasing Department records reveal that more than 65,000 different articles are purchased for the construction, maintenance, and operation of this company. The value of these purchases ranges between 22 and 26 millions of dollars annually in normal years. More than 12,000 of the items are regularly carried in stock. The Stores Department operates 36 warehouses to

provide proper distribution for these items throughout the territory served. The Accounting Department maintains individual accounts of the money invested in the stock of each item. Involved inventories and an elaborate requisitioning system which requires 32,000 requisitions and 75,000 Hollerith cards each month are necessary for proper accounting.

2

Recognition of the Need for Standardization

The causes and symptoms of the disease for which standardization is the best known cure are in most cases well defined and quite easily recognizable. Quite often a company is slow to correctly diagnose the case, and the treatment and cure are correspondingly backward and costly.

Among the more readily detected ailments are:

(*a*). Excessive stocks of materials and replacement parts. Increased capital invested and excessive handling charges are the criteria of this condition. Also there is an actual increase in the number of stock items.

(*b*). The slow movement and stagnation of certain stock items. This is attributable to an unperceived and gradual obsolescence of the items.

(*c*). Time lost in constant, and often fruitless, search for items which alone will serve the need.

(*d*). "Private stocks" of materials, parts, and supplies accumulated by operating departments because of the endless trouble and confusion of procuring these items as required in small amounts.

(*e*). Too great a number of varieties and sizes of materials and supplies.

(*f*). Excessive number of trade-named items being purchased.

(*g*). Discrepancies in inventories and accounting records in spite of an adequate number of competent employees.

(*h*). Lost motion and confusion in requisitioning and purchasing materials. A great number of telephone calls between the buyer and field men are necessary to determine what is wanted. Also many more calls between the buyer and the vendor to impart this corrected information to the latter.

(*i*). The receipt of materials and equipment which must be returned to the vendor because they are not as wanted even though shipped in agreement with the purchase order.

(*j*). The necessity of writing multitudes of small purchase orders.

(*k*). Excessive number of specially designed items being purchased. Evidence of this condition is apparent in exorbitant costs and lengthy delivery periods.

(*l*). A lack of uniformity in the terminology used to describe items. This absence of a common nomenclature results in various garbled, inaccurate, and insufficient descriptions being used by the different departments to designate each specific item.

The details of the process by which standardization is accomplished are seldom understood at first with a great degree of exactitude. However, a self-analysis by most companies with reference to the above-listed complaints will usually reveal that the need for a great deal of simplification is painfully apparent.

3

What Standardization Involves

Standardization appeared from our point-of-view to be the process by which order could be brought out of the chaos that is the natural consequence of handling a great number of items of materials and parts. As an initial act it appeared wise to define broadly the scope of our standardization program both as to type and also as to the limits or extent to which the enterprise should be carried.

Types of standardization

Standardization may perhaps be divided into the two broad divisions of "national" which covers the work done between or within industries and "company" standardization which is that within an individual organization. It is with some of the phases of this latter type that this article specifically deals.

In turn, standardization within a company may have as its aim any or all of several different objectives. Some of these are the development of standards for:

(*a*). Materials and equipment
(*b*). Design (architectural, construction, engineering)
(*c*). Installation
(*d*). Performance and operation
(*e*). Procedure, methods, and practice

It is with the first of these groups that this article specifically deals.

General aims of standardization

So that all subcommittee members would have a clearer understanding of what they were ex-

pected to accomplish, a few broad principles were outlined by the Main Committee of Standardization for the guidance of all. After having given due consideration to the needs and peculiarities of this individual company, it was determined that the ultimate aim of the work of standardization of materials by the subcommittee should be the accomplishment of the following results:

(1). The subdivision of materials into classifications for the purpose of cataloging and records.

(2). Agreement upon, and use of, a standard terminology in the description of all materials.

(3). Establishment of adequate specifications.

(4). Minimizing the number of different items purchased and used by eliminating superfluous types and sizes.

(5). Coordination of decisions with the results of standardization achieved by the American Standards Association and other nationally recognized societies.

4

How General Aims of Standardization Are Accomplished

The accomplishment of the five broad principles set by the Main Committee as the objectives which standardization subcommittees should attempt to achieve is dealt with in this chapter.

Classification

The classification subcommittee assumed, as a working guide, that the two fundamentals of classifying are:

(*a*). The divisions as finally set up should be specific enough to exclude all chance of duplicate listing of items or ambiguity.

(*b*). The final arrangement should also be broad enough so that divisions will not become so numerous as to be cumbersome.

System of classifying—In devising an all-inclusive classification for the various materials purchased by the company several of the different possible methods of approach to this problem were reviewed. Among those given consideration as a basis of classification were:

(*a*). *Items*—An arrangement whereby items of a similar nature are brought together.

(*b*). *Use*—Arrangement of the items according to the use which is made of them.

(*c*). *Departmental*—Arrangement of items according to the department by which they are used.

(*d*). *Alphabetical*—Simple alphabetical arrangement of all items.

A division of all items strictly from a "similarity" consideration places the various items into groupings wherein all of those which are alike are together. For example, all tools are placed in one class and all bolts in another. A "similarity of items" arrangement was chosen by the classification subcommittee on the basis of its almost entirely excluding the possibility of repetition or duplication of items carried in stock.

As opposed to this system of subdividing, the "use" and "departmental" methods presuppose a division which necessarily groups together unlike materials. A typical group following this plan would be "overhead lines materials" which would include all of the items used for this work. Among them would be lag screws and various tools. The chief fallacy of these two systems of classification is that the same items are used elsewhere by other groups or for other work and a great amount of duplication occurs.

A straight alphabetical arrangement is the simplest form. It has the disadvantage, however, of eliminating the possible advantages accruing from any type of selective grouping and was not given serious thought by the subcommittee. However, all of the first three methods have their pros and cons.

The general consensus of opinion within the classification subcommittee was that the arguments in favor of a classification by like items made it the desired method wherever it was practicable. However, it is of primary importance that some one system be chosen as the method of attack and adhered to as consistently as possible. Otherwise, maximum benefit will not be derived by the various groups for whom the classification will serve as a guide, due to the confusion resulting from arbitrarily mixing the fundamental principles.

Choosing main classes—The main classes were arrived at by a gradual "building up" process. Groups of materials which appeared allied in nature, and distinctive enough to be set apart from the other items, were assembled into a class. This latter was given a name distinctive of the materials it contained. "Wire and Cable Conductors," "Valves," "Wiring Supplies," "Packing and Gaskets," "Glass and Glazing Materials," and "Bolts, Screws, Nails, Rivets, etc." are representative of the types of classes finally selected. Vague or ambiguous class names foster faulty classifying. Care was exercised in order that classes were not so chosen that an overlapping would occur. Otherwise, a

single item might correctly be placed in several different locations.

By using a certain amount of ingenuity the classification might be so conceived as to give valuable special information to various groups. For instance, a subclass for "rubber goods" would contain a listing of all materials made of this basic commodity which are used by the company. This information might be of value to the Purchasing Department. It is true that most of the entries would be merely cross references to other classes, but the listing would serve its purpose.

The building up of the main classes was accomplished by studying in detail lists of items purchased and ascertaining the exact nature of each. These lists were presented weekly to the subcommittee by the Standards Group who in turn had compiled them from the records kept in the Purchasing Department. Actually, the work of classifying would have been tremendously complicated had it not been for the availability of these data in the Procurement Group. It might even be said that a finished job of classifying is impossible without the aid of this information pertaining to what materials the organization uses, as portrayed by the record of purchases.

Arrangement of main classes—After the main classes had been determined, it was necessary to arrange them relative to each other. Again the alphabetical arrangement was passed over in favor of the plan of placing kindred classes adjacent to each other. It was decided that all classes of material could quite logically be placed in one of four broad groupings. These four were:

(*a*) Building materials and general hardware
(*b*) Mechanical equipment
(*c*) Electrical equipment
(*d*) Miscellaneous

Within these four general groupings the classes were arranged by placing the kindred materials in close proximity to one another. After all of the classes of material had been placed in the list, the four broad groupings were dropped as a distinctive part of the final classification.

Choosing subclasses—After the main classes of material were finally decided on, items were further segregated into homogeneous groups by dividing the main classes into subclasses. The distinctive groups were isolated and, where appropriate, a miscellaneous subclass was provided for those items belonging in that main class but not like enough others to warrant the provision of a subclass.

Arrangement of subclasses—Subclasses were arranged relative to each other within each main class by again considering the degree of relationship existing between the materials grouped in each of these subdivisions. Wherever a miscellaneous subclass was provided, it was placed at the end. Within each subclass the items are arranged alphabetically.

Replacement parts—It was decided that parts should be listed under the assemblies to which they belong. For example, a switch terminal can be found with the switch for which it is a part and not in the general grouping of terminals. In turn, a "part" was rigidly defined as an item specifically designed for one, and only one, assembly. A bolt included in an assembly is not considered as a "part" if it embodies special design features necessitated by the peculiarities of the mechanism. If it is a regular product of the bolt manufacturers it is found in the main class provided for bolts. Otherwise, serious duplication of stock items would occur.

Border line items—Obviously, it becomes necessary at times to make arbitrary decisions with respect to properly classifying certain materials. The practice has been followed of referring these "border line" items back to the classification subcommittee for correct placement. In such cases it is expedient to cross reference for the sake of clarity. This double listing tends to eliminate confusion in locating an item for which search is being made. However, it was originally planned that an index of items arranged alphabetically would be included eventually in the *Standards Catalog* for the convenience and guidance of those individuals who could not readily determine in which class of material the desired item was classified.

Numbering system—This subcommittee was also assigned the task of developing a numbering system for the items. A seven-digit number was finally chosen. The first two digits designate the main class of material in which the item belongs, the third digit indicates the subclass, and the last four digits comprise a serial number. Thus an item numbered 543-0341 would be in Class 54 ("Valves") and in Subclass 3 ("Globe Valves"), and it would be the three hundred and forty-first item in that subclass. Spare parts have been assigned the serial numbers in the 9000 group. For example, a spare disc for the above globe valve might bear the number 543-9017.

Use—The final classification was adopted by the accounting, stores, purchasing, and various other departments as the basis for their records. It is also the basis for the assignment of materials to standardization subcommittees, and serves as a group index for the publishing of the *Standards Catalog*.

A copy of the classification has been appended to this article.

Terminology—Consider yourself for the moment in the purchasing department of an industrial organization, holding the position of a buyer who is required during the course of a day's work to purchase a combustion boat, some carbolineum avenorius, a can of bitumastic enamel, a decalcomania transfer, a current transformer, a dozen extraction thimbles, an inverse current relay, some Portland cement, a few hundred bolts, and, for gas detection, a number of dancing Japanese mice. Further, presume that the bolts and cement were required to meet exacting specifications and that the transformer was to fit exactly into an intricate electrical layout. Suppose that you were fulfilling the normal detailed requirements of the buying position, such as source finding and getting competitive quotations. In addition to all of this, consider that you were required to discover just who the requisitioner was so that the true nature of the desired material might be drawn from him by direct questioning because the initial requisition was couched in loosely phrased language which was original with the author, and which neglected to include any of the troublesome technical details. You would then be in a prime mental attitude to listen to a plea for an improved and standardized nomenclature.

Definition of correct terminology—It was the consensus of opinion that the agreement upon and use of a standard terminology was highly essential. The general thought was that this nomenclature should be in the form of clear, concise descriptions and should have adequate but not superfluous information. It was felt that the wording of each description should be of such a complete nature that one, and only one, item would fill all of the conditions and requirements as specified without the need of reference to trade names or vendors' catalogue numbers. In order to accomplish this end, many currently common faults of nomenclature must be overcome. Some of the more glaring of these obstacles which need correction are discussed in the paragraphs immediately following.

Many names to designate one item—It is surprising and often enlightening to realize in how many different ways a single item may be described on a requisition for materials or a purchase order. Practically all of these varying descriptions are ambiguous. Many are insufficient, while others are really inaccurate. Few people realize that requests for "columbian spirits" or "methyl alcohol" or "wood naphtha" or "methanol" or "methyl hydroxide" or "wood spirit" or "methyl hydrate" all refer to the same substance which most individuals recognize under the name of "wood alcohol." The little device used extensively in machine shops to clean metallic particles from files is regularly designated by the three names of "file card," "file brush," and "file cleaner." "Old man" and "drilling post" mean the same article, as do "hinges" and "butts." "Bleaching powder" is often referred to as "calcium oxychloride," "chloride of lime," and "calcium hypochlorite." "White enamel," "Barytes," "barium sulphate," and "blanc fixe" are different names for the same item. "Chain falls" and "chain hoists" are synonymous names. There are numerous other examples at hand of the aliases by which common materials are known. However, the above are sufficient to indicate the possibilities for confusion existing in an uncorrected condition of this kind. The principal difficulty is that of one item being duplicated in record entries and stock accounts and its single identity being hidden under the almost impenetrable disguise of several different names. Each separate entry contains only part of the history of this item so that all of the records are worthless.

Many times the duplicate name is merely a nickname started by field men. But they grow to be used so frequently that to distinguish which is correct is much like trying to solve the age-old hen and egg question.

Many items designated by one name—Perhaps as confusing as the single item with many names is the single name which designates many items. A "conduit bender" and a "hickey" are synonymous. But to another group of artisans a "hickey" is a device used in building wiring for lighting fixtures. Items called "adapters" and "reducers" are common to the materials used by pipe fitters, electricians, and doubtless many other groups of workers. A recent requisition calling for a number of "bull dog clips" found its way through error into the electrical group of the Purchasing Department instead of the stationery group. The requisitioner received a number of cumbersome electrical devices instead of the paper clips he desired. To the man in the iron shop a "dolly" is a riveting dolly bar but to an individual working in the pole yard the name "dolly" designates a small, specially designed truck for transporting a pole.

This condition is charged with potentialities for wrong shipments. Again, records are inaccurate due to the pooling together of information under the single entry. Whereas under the previous condition the records were insufficient, in this case they give a distorted picture because of exaggerated quantities.

Trade names—To that group of men whose job necessitates their dealing constantly with names of materials, the trade names of items constitutes the post-graduate work in mental callisthenics or contortions. Numbered among these people are accountants, buyers, storekeep-

ers, and the men in the various record-keeping divisions. At times these names have appeared to be the "superlative defense" of the hidden forces which tend to complicate standardization. Apparently necessary and advantageous to the merchandiser, they can seldom be accepted or countenanced in the best interests of standardization. Compromise is apparently out of the question. In most cases these trade names are impossible from the point of view of acceptable nomenclature.

A requisition which specifies a trade-named item curtails a buyer's initiative in the search for the best source of supply. In many purchasing organizations the buyer has no option but to procure the item specified. The tendency to stifle competitive purchasing does not bode well for the economies of the using company. Consider a requisition for "kleankut" bolts. The buyer could doubtless secure this item under the name of "black iron bolts with hexagonal nuts" from dozens of sources at a nominal cost but the trick name on the requisition compels him to obtain it from one source at an exorbitant price. The records necessary for intelligent purchasing, accounting, and control are impossible where these names are used. Consider the absurdity of attempting to classify such names as "Nobuc," "Use-em-up," Kleenex," "Ezy-Out," "Nokorode," "Retrac Blue," "Signode," "Vulcatex," "Oakite" and "Hytempite."

Insufficient descriptions—Quite often the descriptions used are correct in so far as they go. They err in omission rather than commission. To correctly specify a piece of pipe for a steam line a description should cover all of the following points:

(1). Quantity—Number of units required

(2). Unit—Piece or mill length

(3). Size—Nominal pipe size or outside diameter

(4). Name—Pipe or tubing

(5). Material—Steel, copper, brass, etc.

(6). Type of manufacture—Butt welded, lap welded, electric welded, seamless, etc.

(7). Weight or wall thickness—Standard weight, extra strong, American Standard 250, 400, 600, 900 lb WSP or wall thickness.

(8). Coating or finish—Black, galvanized, lead lined, etc.

(9). Ends—Threaded only, threaded and coupled, plain, bevelled 45 degrees with 1/16-inch shoulder, etc.

(10). Length—Feet and inches or mill (random) lengths

(11). Specification—The Detroit Edison Company Specifications 262, 264, 275, or 276.

That is, a requisition for this material might read: "10 mill lengths, 6 in. IPS pipe, steel, lap welded, standard weight, black, ends threaded only, DE Spec. 264." Consider that a requisitioner were to omit even one of these items, such as "standard weight." The buyer would be compelled to get that information before the material was purchased. Or, if the order slipped through his hands with the omission unnoticed, the vendor would probably hold up the order until the missing data were furnished him. Again, the vendor might ship what he believed was desired. This material might or might not prove satisfactory. In the latter case it would be returned for replacement or would be installed by mistake and a still greater unnecessary expense would be chargeable to the error. But the information acquired through telephone conversations is seldom added to the orders and these, together with the requisitions, are the basis for records. The incomplete requisitions and orders leave much to be desired from the point-of-view of record clerks. It is impossible to place the item with others just like it to carry on the continuous record for accounting and record purposes. The error becomes twofold in that the item is usually entered with the wrong group.

Pipe fittings and valves present an interesting case in point. When this standardization subcommittee started to work they were much interested in what items were carried as stock. Such insufficient descriptions had originally been furnished the Stores Department that it was impossible to tell from their records which of these items were actually in the warehouses. Experts from the Piping Division were called in to straighten out the tangled terminology and supply the missing data.

Another interesting example of the difficulties and expense that might be incurred due to insufficient or faulty descriptions was brought to light during the standardization of carbon brushes. As is generally known, these items are used to establish an electrical contact between a rotating and fixed member of an electric motor or generator. Figure 1, an illustration of these articles, shows 113 brushes. However, over 500 other different brushes were discovered when the subcommittee began hunting around the various repair shops, cubby-holes, and "private" stock rooms of the substations and power plants. These private stocks were maintained because of the difficulty of otherwise procuring the correct item in a hurry. Because these items were not procured through the regular channels, it is quite possible that they were finally charged to an incorrect account such as operating expense

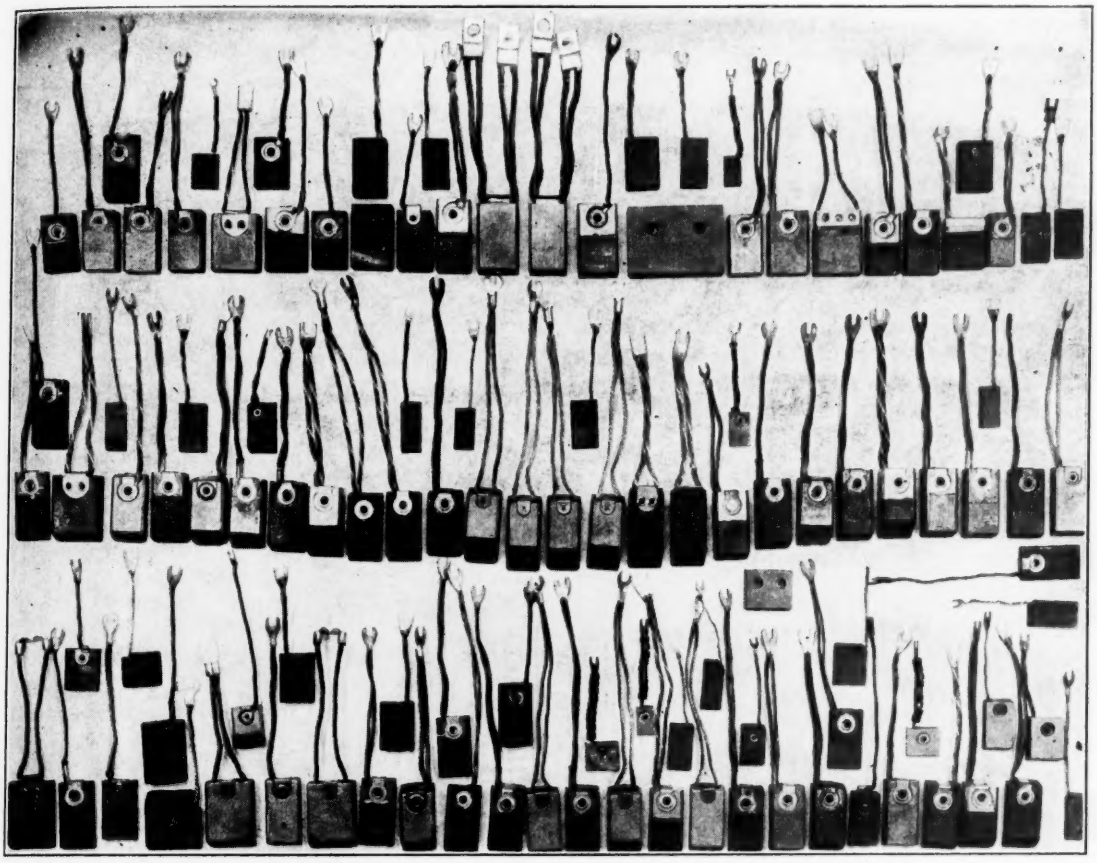

FIG. 1

113 of the 600 carbon brushes carried in various stocks prior to classification

instead of capital investment. These discrepancies create errors in other figures in the balance sheet.

In the case of the carbon brushes in stock the descriptions were so vague that it was impossible to determine from the records just what kinds and sizes of carbon brushes were lying on our storeroom shelves. At the instigation of the subcommittee a sample of every carbon brush carried in stock was brought into the conference room. In a great many instances it was found that several brushes were identical but were carried under different stock numbers. The most glaring instance was the case of a brush that was carried under nine different numbers. These instances of duplication were in some cases the outgrowth of a system of designating the brushes as "brush for motor A" and "brush for motor B." This is an example of erring via the old common pitfall of using a description based solely upon the use to which the item is put rather than listing the characteristics of the item itself.

Blame attaches to no one for this. There are at least 11 distinctive points to be covered in the description of a brush to be sure that the item is correctly specified. Prior to the setting up in the *Standards Catalog* of an adequate guide to be followed in writing requisitions, the descriptions were in many cases written from memory. The Stores Department had only the requisition as a guide in writing up their records.

These duplications involved the maintaining of duplicate records for each of the separate stock numbers. More serious, however, from a dollar and cents point-of-view is the fact that duplicate stocks of these items were maintained. In the case of the nine quantities of one brush being carried, a minimum stock requirement was imposed on each. By properly pooling these supplies together under one stock number, it was possible to raise the minimum requirements only by a slight amount to provide for the entire requirements of this brush, with a corresponding reduction in capital investment in inventories. Since the adoption by the standardization subcommittee of the policy of following the nomenclature for carbon brushes as established by the

joint committees under the auspices of the American Standards Association, there has been no trouble either in the procurement or warehousing of these items.

It can truly be said that incomplete descriptions invite the confusion and errors which are fatal to economy and efficiency.

Cumbersome designations—There is that group of meaningless designations, usually distinguishing grades or qualities, which have grown up with industry. Many of these have outlived their usefulness, while others are quite meaningless except to people familiar with the material.

Consider the case of the "medium," "heavy," and "extra heavy" grades or weights of pipe fittings of several years ago. At the time of its origination the term "extra heavy" was probably considered the ultimate in strength. Modern pressures have relegated it to the minor sizes.

Lubricating oil grades would be simplified tremendously for the layman by designating them as *a*, *b*, *c* or 1, 2, 3 instead of by "light," "light medium," "medium heavy," etc.

Metal-working files are graded as rough, coarse, bastard, second cut, smooth, and dead smooth. Why should the average individual realize that a second cut is between a bastard cut and a smooth cut? Perhaps the *a*, *b*, *c*, or 1, 2, 3 system would clarify and simplify this nomenclature as well. And in this group the names designating many of the cross sectional shapes could be improved upon.

Benefits of correct terminology—The known benefits to be derived from the use of standardized, uniform descriptions are many. Certainly it tends to make each item more easily recognizable to all of the various individuals and departments whose duty it is to keep accurate records of materials or who have need to refer to the item. It is obvious that precise accounts are impossible to maintain if the descriptions of the materials are couched in such insufficient and varied terms as to make unrecognizable the correct classification of the article. The various departments which would be benefited by the use of a standardized terminology for all materials include: Stores, Purchasing, Requisitioning, Shipping, Receiving, and Property Accounting. The greater understanding between buyer and vendor which is promoted by precise and accurate descriptions results in a reduction of shipments of wrong material. Delays in shipments are also the result, at times, of the confusion induced by improper descriptions.

Establishing a correct terminology—Pointing the way to the establishment of a nomenclature which would correct all of the faults just outlined is beyond the scope of this article. Such an effort would be to attempt an adjustment of the foundations of the language.

However, a unified, standardized industrial terminology is very possible and workable. A clear, concise description which would always be used in reference to a specific item would clarify the situation tremendously. The use of this one description in its entirety each time the item is referred to would eliminate much confusion and error. Let it contain adequate but not superfluous information and, if adhered to by manufacturers and users alike, it would become recognized as the accepted name of the item.

Our own subcommittees have attempted to make the description of each item complete. They have also accepted the most commonly recognized name used in reference to the material, compatible with clarity.

There is truth in the adage that "a grapefruit would squirt in your eye under any other name." There is also truth in the statement that procurement and distribution of this item are probably much less complicated because it has just one name and is not referred to as "gadget" or "gimick."

Specifications

This section will deal only with the small group of specifications which are printed separately for attachment to purchase orders. It will not discuss that vast group of specifications for items that are prepared by subcommittees and printed in the *Standards Catalog*.

The Purchasing Department is responsible for maintaining the file of specially printed purchasing specifications for The Detroit Edison Company. However, its responsibility is quite largely that of custody and coordination during preparation.

Definition—"Specially printed purchasing specifications" refer to a group of materials descriptions which are so involved, both technically and in length, that it would be impractical to type them on a purchase order each time that material is desired. For that reason the description is carefully written and then printed as a separate story. The printed matter is clipped to the order, rather than being retyped. This particular type of printed matter has quite generally come to be known as "purchasing specifications." However, this same term applies equally well to the typed matter on every purchase order that is written. The printed "specification" differs from the materials descriptions only in its involved nature. For instance, a requisitioner desires some bolts. If the regular standard manufactured product will suffice, the purchase order will be written specifying type of bolts, shape of head, material, what standard, necessary sizes, and the shape of nut and its standard. If, however, it is desired to have this bolt made of a specific grade of special

steel to meet certain requirements, and the bolts find constant application in our service, a separate specification is written for the steel in order that it may be used for quotations and attachment to the order. This eliminates possible errors in typing, possible omissions of information, and is a time saver. These three advantages are the justification for the specially printed type of specification.

Types of purchasing specifications—There are, broadly, two distinct types of separately printed purchasing specifications. The first describes in detail a single kind of item. The one covering common brick is a good example. The other type describes a material from which many different items may be made. An example of this type would be a specification that covered a certain grade of steel. Also within this second grouping is the kind of specification which describes a process, such as galvanizing.

Origin of request for specifications—While the specifications are written in the Purchasing Department, the work is done only at the instigation, and with the approval of, the group using the material. Prior to standardization these requests were received directly from the using department. However, since the inauguration of subcommittees, the logical method of procedure dictates that the department desiring a specially printed specification should have its representative on the subcommittee considering that material present the request for consideration. This system is followed to some extent at the present time.

Guide in writing specifications—To aid in the writing of specifications the Purchasing Department maintains up-to-date files of nationally recognized standards such as United States Government, United States Navy, American Society for Testing Materials, American Standards Association, National Electric Light Association, General Motors, and others.

As a general guide in the writing of purchasing specifications the following points are adhered to:

(*a*). The specification should describe accurately the material and its properties.

(*b*). The wording should not be couched in involved technical phraseology but rather it should be worded as simply as is consistent with clear meaning so as to be easily read and understood.

(*c*). The specification should be specific.

(*d*). Methods of inspection and test should also be described.

(*e*). Nationally recognized standard specifications should be adhered to as nearly as possible.

Development of a specification—The development of a specification, after the need for one has become apparent, is along the following lines. The Purchasing Department volunteers either to assist the originating group in the preparation of the desired specification, or to write it, subject to approval of the latter. The wishes and requirements of the various departments are considered and all ideas correlated. The final draft must be approved by the departments using the material, the chief of the Research Department, and the Purchasing Agent. Any group requisitioning material under a given specification is held entirely responsible for the application or appropriateness of that specification to the material desired.

In drawing up the original draft, existing standard specifications are reviewed. If an adequate one is found it is adopted. In case one is discovered that quite nearly conforms to our requirements, it is adopted with the necessary modifications. During the materials study necessary to develop a satisfactory specification, the question of whether a given material is not good enough or is too good for a particular use is brought to the attention of all interested parties. The buyer, the designer, and the user are all interviewed. In this way the attention of the designers and operating engineers is directed to the variations in quality of standard commercial goods. At the same time the difference in cost between standard qualities available on the market and specially designed items, whose quality varies but little from standards, is emphasized.

Revision of specifications—Specifications are subject to revision whenever it is necessary to bring them up-to-date. At regular intervals they are sent back to the responsible department for review. If revision is not necessary, the specification is approved in writing and returned for filing. If revision appears necessary, the proposed correction or change is noted on the copy and the original procedure of approvals is again gone through.

Use of specifications—When requesting quotations, the Purchasing Department sends, to the firms asked to quote, a copy of the specifications covering the material under consideraion. At the time the order is finally placed, these specifications become a part of the formal order.

Advantages of all specifications—Some of the advantages of all specifications are:

(*a*). All vendors are able to bid on the same basis.

(*b*). The buyer is enabled to know exactly the definite requirements of what he is buying.

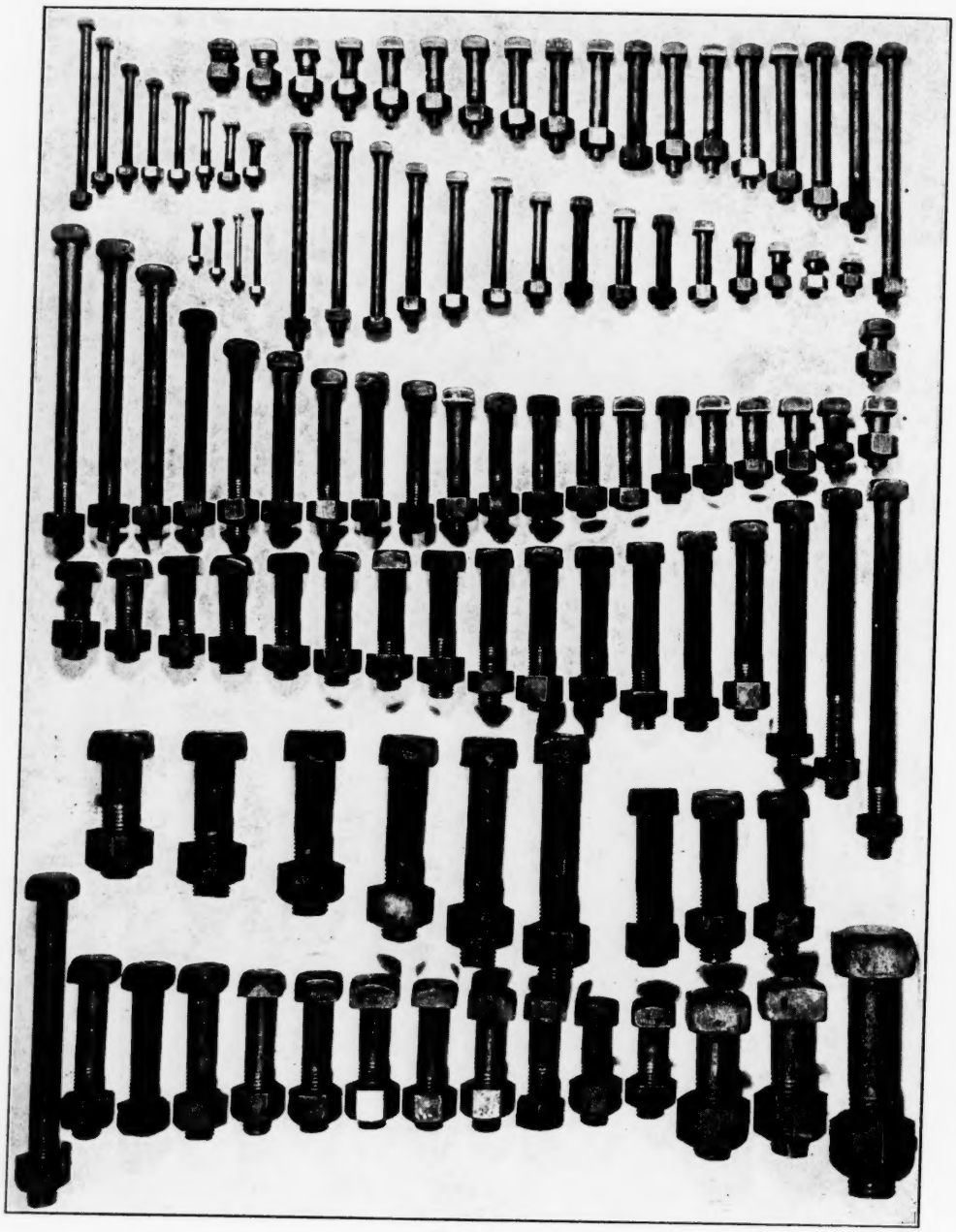

FIG. 2

Former stock sizes of black iron bolts and nuts

(*c*). Real inspection to determine whether the correct quality of material is being received is made possible.

Elimination

The extravagance of unnecessary types and sizes of materials and equipment goes back to the foundations of industry. If each industrial organization continues to order items in odd sizes, styles, and colors, the manufacturers will continue to follow the dictates of the customers' whims. By so catering, the reductions in cost to both producer and consumer which are made possible by modern mass production are forfeited. The number of different items purchased can be minimized by the elimination of superfluous varieties and sizes. The economies of an organization can also be improved by the elimination of trade-named products, special items,

and those which are too good for the job intended.

Reduction of types—The reduction of varieties of items is usually brought about through the substitution of one item for many others. Presume that the company was using a number of types of figured glass such as Florentine, hammered, maze, syenite, apex, and ondoyant. If, after having given due consideration to the aesthetic appearance of buildings and the other factors involved, the subcommittee decided to eliminate all types but one, a pure case of the elimination of unnecessary varieties would be accomplished.

Similar products from a number of vendors may be equally desirable for the service intended from the standpoint of performance. A selection of two or three items should be made from this group with the idea of using them to the exclusion of the others. Adaptability for the service intended being equal, the selection should be made on the basis of adequate source of supply and price. Either laboratory tests or actual experience under service conditions, or both, can be relied upon in determining the relative merits. A self-limitation by using departments to a choice of two or three of these similar items does not hamper their activities nor curtail their efficiency. Subcommittees are constantly reminded that standardization which limits the source of supply to one manufacturer should be avoided.

The illustration of carbon brushes (Figure 1) pictures a great variety of items designed to perform an identical function. When one considers that these are only 113 of the more than 550 varieties used by this company to accomplish one purpose the thought occurs that perhaps several dozens instead of several hundreds might be designed to suffice.

Reduction of sizes—The elimination of superfluous sizes is an exceedingly interesting problem. In the past designers, like most other groups, gave very little thought to a unified code of sizes. Special dimensions were specified with slight regard for existing sizes. Various industries with different requirements created demands for similar types whose sizes varied but little. These different items and sizes gradually assumed the status of recognized standards. The modern designer had the privilege of choosing at random from this conglomerate scramble of sizes. Certainly any large organization with diversified interests has a great many of these odd sizes in its varied equipment. The apparently logical way of combating this is through the designers of the equipment.

The problem is a little different, however, relative to the majority of sizes of materials used regularly for construction and maintenance work. Figure 2 shows 107 sizes of black iron bolts with hexagonal nuts which were carried in stock. There appears to be a wide variety of lengths and diameters from which to choose. In addition to the bolts shown, there are also adequate stocks of the same types and sizes differing only in that they have square nuts. Still others of the same type are galvanized. It is convenient to have a supply to choose from which will permit the selection of the exact size and material wanted. Occasionally this is absolutely necessary. One cannot help but feel, however, that if the designers of the machines for which these bolts are desired had adhered to a standardized code of sizes, a smaller number of sizes of bolts in stock would have met all contingencies.

The elimination of sizes has been accomplished by subcommittees establishing a uniformly graduated scale of sizes. Prior to standardization, there was no guide other than the published sizes in vendors' catalogues. Quite naturally the entire gamut of sizes was ordered during a period of time. After carefully considering the company's requirements of an item, the subcommittee would attempt to establish as standard every third or fourth item in the list of those available. For instance, if carbon brushes were manufactured in lengths varying by one-sixteenth of an inch, our subcommittee would attempt to establish quarter or half-inch gradations as our standard.

At times an odd size is required for some specific job. This size is included as a standard without destroying the continuity of the series. Figure 3, illustrating cold rolled bar stock, is a good example. The first time the subcommittee reviewed this material all of the sizes shown were established as standard. A marked reduction had been achieved. After a year the list was reviewed. The sizes shown in solid black were all of the original list that were retained.

Elimination of special items—Through unfamiliarity with articles available on the market, designing groups will at times design items to meet their individual needs. These items are almost invariably special and, as such, cost an excessive amount.

Standardization subcommittee meetings are ideal gatherings at which to review these items because of the presence of members from all interested departments. The buyer is there to present whatever may be available on the market. The shopman is able to point out expensive operations in the design as it stands. Many times the "special" item is replaced by a standard manufactured product.

There are cases where the special item or size is required for the maintenance of equipment. In these instances elimination is impossible.

Elimination of inadequate items by improvement in design—Not all of standardization has to do with the acceptance of manufac-

turers' products in preference to those conceived within an organization.

instances of an article being too good for the job intended. The selection of this type of item

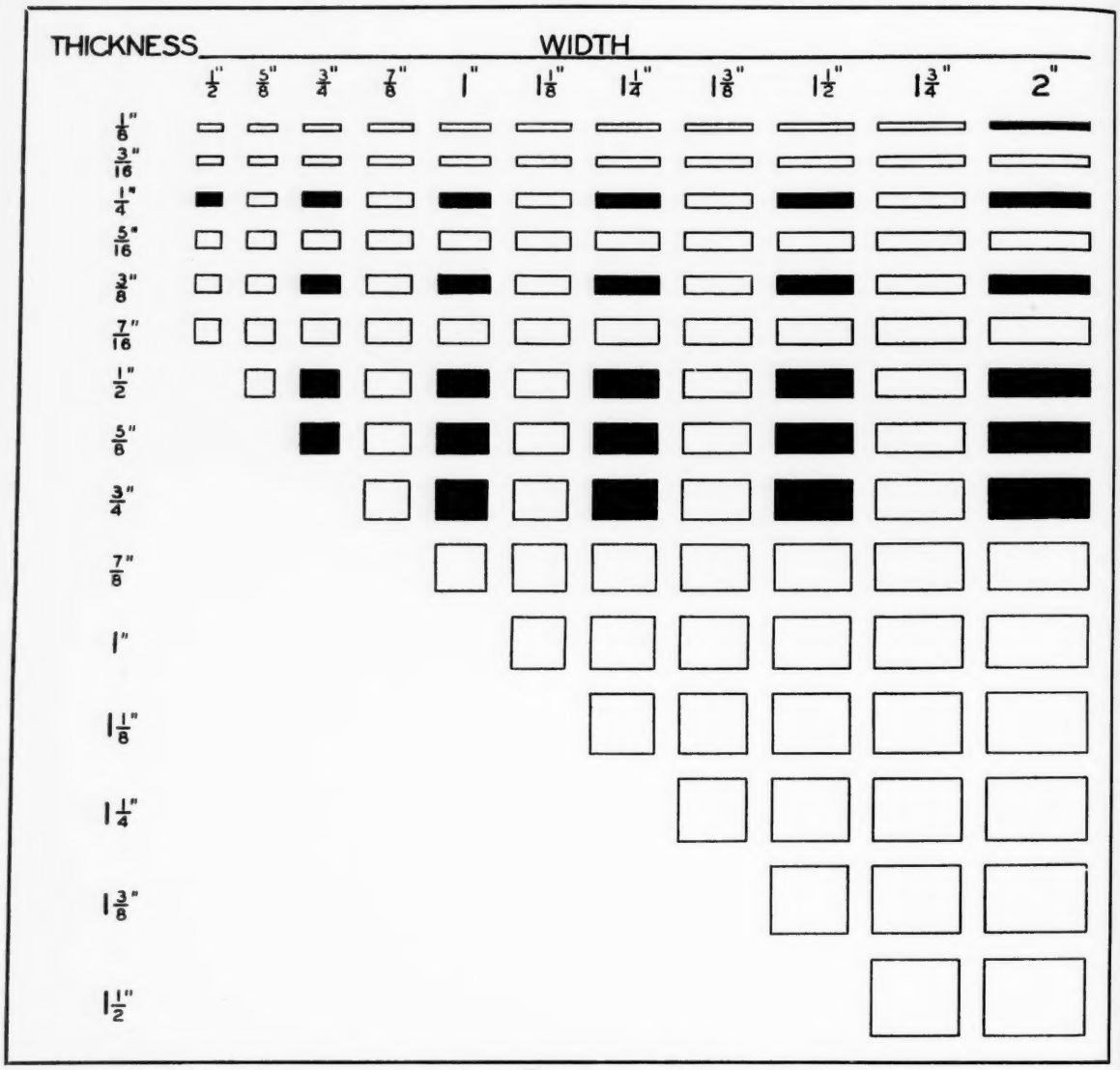

FIG. 3

Chart showing reduction in number of standard sizes of cold rolled bar stock (solid black shows sizes retained)

In some instances the design of an item may be improved considerably. In several instances the members of subcommittees have designed an item which corrected all of the known weaknesses in the manufactured product and the new design has been accepted as their standard of manufacture. The bus bar bender, lineman's safety belt, and tool bags are examples.

Eliminating items too good for the job—Not always is it wise for a subcommittee to accept the item which is of the best quality. There are

is a poor economy. Subcommittee members are getting away from the old practice of thinking that "the best is none too good" and "none but the best will satisfy." They are learning through the gospel of dollars and cents that the quality of a material should be selected to fit the service required. In many modern industries the margin of profit is so thin that the correct selection, use, and purchasing of materials is the difference between profit and loss.

Source of supply not to be limited—It is con-

tinually impressed upon subcommittee members that standardization which limits the source of supply is not conducive to real economy.

If it is impractical at any time to develop a usable description for some material, a single proprietary, named item should never, except in extreme cases, be standardized on. The plan followed by our subcommittees is to select two or three satisfactory products for each service. This gives the buyer an opportunity to exercise his prerogative of buying rather than simply placing an order.

Caution against hampering progress—The last several paragraphs have dealt exclusively with ways and means of eliminating items. However, there is the constant danger of overdoing the reduction. Presume that an overly enthusiastic subcommittee decided to eliminate for use within this Company all nails except the ten penny-weight item! Or that by their overzealousness they discarded all bolts except those that are three inches in length. The two examples are quite easily recognized as ridiculous situations and the possibilities for harm are readily apparent. However, if the subcommittee members did not use a great deal of intelligence in discarding items this condition might be approached, even though not actually reached. The condition would be unperceived and, therefore, more latently harmful.

The greatest possibility for harm in the careless and unstudied elimination of types and sizes is that of curtailing the initiative and hampering the progress of designing groups. Up to the point where standardization cuts down the number of items with which the designer works but leaves him enough to accomplish his task efficiently, a great good is accomplished. Any elimination beyond that point is a serious handicap.

Standardization should not in any way be allowed to hinder the adoption of improved materials and devices. It rather should be made the instrument through which proper investigation and adoption are readily achieved. Any tendency toward stereotyping design should be discouraged and the use of new and improved materials fostered.

Subcommittee members are encouraged to present new materials which appear to have merit and might advantageously be used by the company. In their elimination work the policy has been not to let the pendulum swing too far but rather to fall short of a complete reduction job during the preparation of their original recommendations. The illustration of cold rolled steel flat bars (Figure 3) is an example of this.

Coordination of efforts

It is quite obvious that no permanent good could evolve from standardization arrived at through the disjointed efforts of individual groups working separately and toward different objectives. However, it is felt that much good can be accomplished through the concerted efforts of all groups working toward a national unified code of sizes and nomenclature as an objective.

The policy of the various standardization subcommittees has been to accept in so far as possible all national standards pertaining to their particular type of material. As close an affiliation with these national groups as is possible is maintained by the Standards Group. Prior to the meeting of each new subcommittee the Standards Engineer assigned to that group looks through all of the national standards on record and selects those which pertain to the class of material under consideration. In making decisions relative to these items a great deal of importance is attached to the national standards and they are accepted unless there is good and sufficient reason for not doing so.

As soon as new national standards become available an effort is made to make our requirements conform to them. Part of the routine of the Standards Group is to keep informed on the latest developments in national standardization. Files are maintained of the latest approved standards.

German Standardization of Speeds of Machinery

The German National Board for Economy (Reichskuratorium fuer Wirtschaftlichkeit) has published a 96-page booklet entitled *Principles and Application of the Standardization of Numbers of Revolutions* by Professor Georg Schlesinger of the Engineering Academy of Charlottenburg. The writer discusses the subject in its relationship to the use of series of preferred numbers, on the one hand, and such problems as the requirements of transmission equipment and machine-tool drives, on the other.

The general problem affects, among other things, the widths and diameters of belt pulleys, and the speeds of transmission shafts; also, it is closely connected with the speeds of electric motors used as driving units for transmissions and machine equipment. Practical examples are given of application of the principles involved to the driving mechanism of a milling machine, a shaper, a radial drill, and a lathe.

National standards for the width and diameters of pulleys and for the rpm of transmission shafting were set up in Germany years ago. The problem is of interest to American industry in connection with the work going on in the Sectional Committee on Speeds of Machinery (Z18) under the procedure of the American Standards Association.

American Society of Sanitary Engineering Becomes Member-Body of ASA

The American Society of Sanitary Engineering has just become a Member-Body of the American Standards Association with A. R. McGonegal, Plumbing Inspection Division, Engineer Department, Government of the District of Columbia, Washington, D. C., as its representative on the ASA Standards Council.

Thomas M. Dugan, McKeesport, Pennsylvania, is president of the American Society of Sanitary Engineering; James R. Walker, Waterbury, Connecticut, is secretary; and Jere F. Dowd, Cincinnati, Ohio, is treasurer.

The membership of the American Society of Sanitary Engineering includes federal government, state, and city officials concerned with enforcement of rules for mechano-sanitary materials and construction—such as plumbing inspectors, health officers, refrigeration inspectors, and inspectors of domestic heating and air conditioning; design and research engineers for manufacturers of sanitary fixtures and appliances; teachers of sanitation, writers on sanitation, and members of allied educational groups; master plumbers who have engaged in special activities relating to the advancement of sanitation, or who have achieved distinction for large and intricate construction; and an associate group of master plumbers, journeymen plumbers, students, and others who are interested in the aims and objects of the Society.

The American Society of Sanitary Engineering believes in and works for the attainment of the following principles:

Gradual perfection of the National Plumbing Code

Better plumbing codes locally where standards are now below the present National Code

Plumbing codes in states, cities, and towns now without their undoubted benefit

Adequate and universal inspection of plumbing

Purification of water supplies

Elimination of stream pollution

Safe sewage disposal

Standardization of plumbing material and practices

Education in the fundamental laws of sanitation

Experiment and investigation of all phases of sanitation

Publication and distribution of reports and other educational matter

The Society believes that sanitary effectiveness, in so far as plumbing, heating, and air conditioning design and construction are concerned, can best be served by developing a universal practice or standard to work to; that standards in design of fixtures, fittings, and appliances simplify methods of installation as well as methods of manufacture; that such simplification, through stock reduction, mass production, and other advantages tends toward reduction in cost of manufacture and installation, as well as improvement in design; that such reduction in cost tends to increase the number and improve the quality of sanitary installations, and thereby contributes to a higher health index of city, state, and nation.

Of the several standing committees of the Society, the Research Committee and the Sanitary Standards Committee are concerned with standardization.

The Research Committee, through several subcommittees, is carrying on studies on the following:

The supply of wholesome water for industrial workers; purity, temperature, and outlet spacing

Safe sewage disposal

Standardization of safe weights, thicknesses, and design of materials

Fixture design resulting in a more sanitary and better class of fixtures, especially in hospital work

Swimming pool sanitation

It is also carrying on other investigations which may lead to definite lines of study. Certain of these studies may at any time be brought to a point where the need for standardization is indicated.

The Sanitary Standards Committee is primarily for the service of manufacturers who may wish to submit a fixture, device, or method for advice and determination as to sanitary effectiveness. This committee is not concerned with standardization from a mechanical or constructional standpoint, but is interested in standards of sanitation.

Symbols Standardization[1]

by

Sanford A. Moss[2], *Research Engineer*
General Electric Company[3]

Consideration governing the standardization of symbols and suggestions for the use of symbols in books and articles

"aaaaaaa ccccc d eeeee g h iiiiiii llll mm nnnnnnnnn oooo pp q rr s ttttt uuuuu." This is the way in which Huygens announced a discovery in 1655. The general idea at this era was to surround a scientific statement with as much mystery as possible in order to increase the mental effort required to master it. The reader must admit the success of the plan. Such anagrams then were used quite extensively, and Hooke's law of elasticity, giving the constant ratio between stress and strain, was announced in the same way. Huygens after restored the letters of his anagram to their proper places and published "Annulo cingitur, tenui plano, nusquam cohaerente, ad eclipticam inclinato." This statement was in Latin, so that it was still clouded in mystery for the average reader. The translation is "The planet is surrounded by a slender flat ring, everywhere distinct from its surface, and inclined to the ecliptic" and gives the first mention of the rings surrounding the planet Saturn. Even in recent times, it was considered desirable to surround a statement of a scientific or mathematical fact with some difficulty so that a certain amount of mental effort had to be spent before a reader was put in possession of the fact, and before he could concentrate on the mastery of this fact. There even still exist a few college professors who, for the sake of the mental drill which is supposed to accrue by using an unabbreviated method, do not permit their students to use short cuts in solving a formula. Fortunately, such ideas are practically abandoned in modern times, from realization that it is desirable to put a reader in possession of a fact or formula with the least possible expenditure of mental effort on the language or form of the formula, in order to permit concentration on the fact which the formula conveys. The most important thing which can be done to secure this is to arrange that all authors writing on a given subject shall use the same mathematical symbols in their formulas. For example, *D* in a formula always denotes "Diameter." Readers readily learn such a set of standard symbols and are thereafter saved an appreciable amount of mental effort. The mind can then be concentrated on the subject-matter itself rather than on the language in which the subject-matter is expressed. At the present time a university student who may be taking courses in engineering thermodynamics, physical chemistry, theoretical chemistry, and chemical engineering usually finds an entirely different set of symbols used for given concepts, in each of the departments mentioned. The mental readjustment that is required each time a student starts a new recitation gives a handicap which easily could be eliminated.

Symbols standardization

In order thus to make texts carrying formulas as easy as possible, a project was initiated some years ago—Standardization of Scientific and Engineering Symbols and Abbreviations (Z10)—under the sponsorship of the American Association for the Advancement of Science, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education, to be carried out under the rules of the American Standards Association. As a result, there now exist lists of mathematical symbols for use in formulas in Hydraulics, Mechanics, Structural Engineering and Testing Materials, Heat and Thermodynamics, Aeronautics, Photometry and Illumination, Electrical Quantities, and Mathematics, which are American Standards or American Tentative Standards. These lists can be obtained from the American Standards Association, 29 West 39th St., New York City. Each of these lists was prepared by a competent committee in its individual field. The symbols were selected in each field so as to take account of current practice, and in the frequent cases where there was diversity of practice, to adopt the

[1] Reprinted from *Engineering Education*, January, 1932.

[2] Representative of the Society for the Promotion of Engineering Education (sponsor) on the Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Z10).

[3] West Lynn, Mass.

symbol most likely to meet universal acceptance. Many cases, of course, were found where a given concept occurred in several of the lists. It has been possible to use the same symbol in nearly every instance, and it is seldom that a given concept has a different symbol in different lists. In view of current practice in the respective fields, such few cases were accepted as inevitable. All of the standardization mentioned is for symbols used in mathematical formulas. The same project also includes standardization of graphical symbols, as used on drawings and plans, and of abbreviations, as used in a body of text or in tables and headings. A few of the lists in these subjects are complete and a number nearly complete.

Acceptance of standard symbols

Standardization in general is a very modern development. Only a few years ago, every manufacturer of machinery made his parts to suit himself and used his own system of bolt threads, etc. Such an arrangement was considered very desirable because then new bolts and other parts for repairs would have to be purchased from the original manufacturer. On this basis, every author would use his own set of symbols in an effort to compel readers to use his own publications exclusively. There is no need to go into the advantages arising from the abandonment of such ideas and the standardization of bolt threads, pipe threads, carburetor flanges, taper fits, and thousands of other machine items. Similar advantages will result from symbols standardization.

There have always been a great many conservative people who question the wisdom of machine standardization. Exactly the same thing will, no doubt, occur with respect to the standardization of symbols. Many authors will ignore the advantage to their readers of the use of the same symbols which every one else employs. Other writers will want to wait to see if every one falls in line before abandoning their own symbol customs and adopting the standard ones. In many cases, the real reason back of such an idea is the mental inertia of the author himself to change his own habits. Often an author writes in terms of a heterogeneous lot of symbols to which he has become accustomed, beginning with his own experience as a college freshman. It is, of course, natural that an author should feel that the symbols which he uses are in general use, whereas actual investigations would show equal or greater use of other symbols. Of course, the easiest and laziest procedure is that an author will continue use of his own symbols without question. The more effort, however, that an author spends in making his symbols as well as his text easily managed, the more popular he will be with his readers.

Principles of symbology

Modern customs with respect to symbols, signs, and forms of mathematical expression are the result of evolution since the first mathematical writings of the ancient Chaldeans, Egyptians, and Hindus, and continuous changes have occurred, all directed toward simplicity in expression. The original Egyptian and Hindu algebra had a form which was very hard to understand, and multiplication and division with Roman numerals was a very serious operation. However, all such items have been perfected by centuries of work, so that present customs with respect to symbols, signs, and forms are the best means known, at the present time, to minimize mental effort.

It is often thought that use of words or abbreviations instead of letter symbols will make mathematical expressions more easily understood by people who are not used to them. For instance, the following are two ways of stating the same fact:

(*a*). The circumference of any circle is found by multiplying the number representing the diameter of that circle by the number 3.1416.

(*b*). C = circumference of a circle,
D = diameter,
π = 3.1416,
then $C = \pi D$.

It is probably true that if an individual were to have use for such a piece of information at rare intervals, the form (*a*) would be preferable. If an individual, however, is going to use such information frequently, it will be much better for him once and for all to make the slight effort required to learn that (*b*) gives the same information as (*a*), in order that his mental effort thereafter will be minimized. Many people give themselves extra mental work for years by continuing to need expressions such as (*a*). If they would devote perhaps half an hour to learn the use of expressions such as (*b*), they would thereafter be much better off. Possibly instruction in elementary algebra is deficient in this particular item. A person who continually uses expressions such as (*a*) instead of expressions such as (*b*) is in about the same state as a person who has to walk everywhere he wants to, because he has never made the slight effort to learn to climb into a street car or an automobile.

The term "symbol" or "mathematical symbol" applies to a sign or letter used in a mathematical formula or equation, as a representative of some number which is to have performed on it the operation indicated by the equation. A "mathematical sign" is an indication of a mathematical operation which is to be performed. An "abbreviation" is a shortened form of an ex-

pression or word, to be used in texts, tables, or headings, but never to be used in formulas. A "chemical symbol" is a representation of a chemical element, used in chemical formulas. These are already standardized internationally, and need not be discussed here. A "graphical symbol" is a sign used on plans or drawings to represent a certain object which is to be erected.

The following are examples of the use of *C* in all of these ways. The meaning in each of the ways is so obvious that there is no chance of confusion with the other ways.

$$C = \pi D.$$

This is a mathematical formula and *C* is the symbol for circumference.

$$V = (2gh)^{1/2}.$$

This is another formula, and (is a mathematical sign which with another sign) denotes that 2, *g*, and *h* are to be included together.

Temperature $-20°$ C

Here C is used as an abbreviation for Centigrade.

$$C + O_2 = CO_2$$

This is a chemical formula and C is the chemical symbol for the element Carbon.

C

This is part of a wiring layout and denotes that a circuit breaker is to be inserted in an electric line wire.

The reason for the rule that abbreviations are never to be used in formulas is the extra labor and opportunity for confusion which would be involved by using expressions such as the following third way of stating the fact given above:

(*c*). Cir. = $\pi \times$ Diam.

It is now the universal custom in algebra that when letters in a formula follow each other without separation they are to be multiplied together; that is, "*abc*" means the product of "*a*," "*b*," and "*c*." According to this rule, "Cir." would mean the product of "C," "i," and "r." If formulas sometimes had groups like "Cir." which represented a single expression, and at other times groups like "*abc*" which represented three individual numerical values, confusion would of course occur. It has, therefore, become a rule that a symbol used in a formula should always be a single letter, and never a combination of several letters or an abbreviation.

When there are a number of quantities of a single kind which are to be distinguished from each other, subscripts are used which are minor letters succeeding and placed slightly below a major letter and forming with it a single symbol. Therefore, the way to handle quantities, such as inside diameter, outside diameter, and pitch diameter, is by use of symbols such as D_i, D_o, and D_p. It has often been proposed that such quantities should have the symbols *ID*, *OD*, *PD*. Once again, if a person who is to use symbols will take the very slight amount of time required to understand the very general use of D_i, D_o, and D_p he will thereafter be saved mental effort.

In a recent attempt to use a group of letters as a single symbol, with an idea of making a formula easy to understand, there occurred the following formula:

$$VS = VPig + VPip.$$

With use of symbols according to the standard, system, this formula would have been:

$$V_s = V_g + V_p.$$

It is certainly easier in the long run to use formulas based on this standard system.

It is to be noted that sin, cos, tan, etc., used in formulas for sine, cosine, tangent, etc., are mathematical signs. For example, consider the expression,

$$a/b = \cos \theta.$$

Here "cos" is a sign denoting that θ is to be submitted to a certain mathematical operation called "taking the cosine," and the resultant value called "cos θ" is a symbol to be used in the formula. It should always be obvious that "cos" is a single mathematical sign and not a group of symbols c, o, and s, whose product is to be taken. Modern practice in the use of the signs for trigonometric functions never gives rise to any question in such a case.

A very common disability with respect to symbols, unfortunately most prevalent among the better authors, is the definition in the midst of the text of each symbol at the first place it is used. Then the deduction of most equations is preceded by several symbol definitions, "Let *V* be the peripheral velocity. . ." For instance, a leading book on the theory of gases gives, in the midst of a paragraph, ν (Greek letter nu) as the symbol for "molecular density." Thereafter in the formulas ν is used without further definition. Three or four chapters on, if the reader has forgotten how ν was defined, he must go back and search through the text to find the place where it is given. This particular book commits another serious offence by also using λ, μ, and ν as direction cosines, to define the direction of a vector, so that the same symbol ν is used with a second wholly different meaning. After a few equations using ν with the second meaning, comes an equation using it with the

original meaning. The author is so engrossed in his subject, and is so familiar with his own symbols that he assumes that his readers are equally expert, which is far from being the case. The mathematics in this particular book are very difficult and possibly the author feels that any one who can master them does not need to have a symbol system easy to understand. Yet the present writer and no doubt many others often lose hours in trying to puzzle out a mathematical text-book because the author has not given a definite statement covering certain symbols. Fortunately it is getting to be a common custom to include in a book or article a complete list of all of the symbols used.

In a text-book, or even in a mathematical article, it sometimes happens that it is desirable to use a given letter for two or more independent concepts, which of course is shown in the Table of Symbols. If the equations containing the two uses are entirely distinct, no confusion will be caused. For instance, n is the standard symbol for revolutions per unit time as well as for the exponent in the gas equation $pv^n = C$. If there is any possibility for confusion, a subscript must be used for distinction.

R'sumé of rules for using symbols for conservation of mental effort

1. An author should realize that before his readers can begin to understand his subject-matter they must master his symbols. Therefore, it is worth considerable effort to transmit to the reader a convenient and easily understood set of symbols.

2. A complete table of the symbols used in a book, article, or paper should be given, preferably at the beginning, where it will be certain to strike the reader's attention. If the symbols are wholly or largely given in an ASA list, this will, of course, be mentioned. These lists are not yet widely enough circulated to warrant omission of the author's list. Such a table will eliminate the very poor practice of defining an often-used symbol in the text the first time it is used, which compels a reader to search through the text time after time to find the meaning of each symbol, when he is going over equations. However, if a symbol is used once only, and never referred to again, it is proper to define it in the text at the one place when it is used, so as not to burden the Table of Symbols. On the other hand, all symbols used more than once should be given in the Table of Symbols, and not alluded to in the text at all.

3. The symbols of that one of the various ASA lists which is nearest to the general subject of a given text should be used. Of course, it will often occur that an author will need symbols not in this list, and then search must be made of related lists. If no list contains a desired symbol, a symbol of a related concept may be used with a subscript. If this is not possible, a new symbol must be selected, naturally following whatever current practice may exist.

4. When, in a given discussion, different concepts from one or more lists of ASA or other suitable symbols have the same symbol without alternatives, this symbol preferably should be used for each concept. If there is any possibility of confusion, there should be added subscripts, selected by the author, in all cases or all but one case.

5. Various quantities related to a concept for which a symbol is given in an ASA list are to be denoted by the given symbol, with subscripts, usually to be selected by the author. Thus, various diameters are to be denoted by D_1, D_2, D_a, D_b, D_i, etc.

6. The same symbol should be used for a given concept, regardless of the number of special values which occur, and subscripts or superscripts should be used to designate special values.

7. Letter subscripts should be used to denote values under special conditions or in special states. A subscript consisting of two letters (not separated by a comma) denotes a value or a change of value between two conditions or states. For example:

Specific heat at constant pressure	c_p
Specific heat at constant volume	c_v
Thermal efficiency	e_t
Mechanical efficiency	e_m
Heat content of dry saturated vapor	h_g
Change in specific volume during vaporization	v_{fg}

8. Numerical subscripts should be used to denote values at designated points in an apparatus, process, or cycle. A subscript consisting of two numbers (not separated by a comma) denotes a value or a change of value between two points, sometimes requiring specification of path. For example,

Initial pressure	p_1
Final pressure	p_2
Weight of a major item	W
Weights of auxiliary items	W_1, W_2, W_3
Heat per pound transferred between point 3 and point 4	q_{34}

9. The same symbol should be used, regardless of units. Thus v is specific volume, whether cc per gram, cc per mol, or cu ft per lb be used.

10. In cases where more than one system of units is used in a discussion, a single symbol may be used, with addition of subscripts, superscripts, or indices to denote units other than the primary one. For example, p, p_o, p', P''.

11. In order to increase the clarity of printed matter, which is practically always Roman, symbols alone or in equations should be printed in italics.

12. Where possible, capital letters should denote total quantities and small letters should denote specific quantities, or quantities per unit. For example, S may be entropy of any mass, and s may be entropy of unit mass.

13. A symbol for a single concept is always to be a single character, with or without subscripts. Two or more characters together of equal rank denote a product.

Foreign Standards Available through ASA

New foreign standards available to Sustaining-Members for loan or purchase through the ASA office. This list supersedes the post card formerly mailed to Sustaining-Members. It will be necessary in requesting copies of the standards to state only the ASA serial numbers preceding the titles.

ASA serial number

Denmark

24. Knives for hospitals
25. Rough round washers, 1/4 inch to 6 inches and 6 to 80 mm
26. Screw heads, heights and chamfering of hexagon and quadratic heads, 1/4 inch to 4 inches and 6 to 80 mm
27. Semi-bright round washers, 1/4 inch to 6 inches and 6 to 80 mm
28. Spoons for hospitals
29. Technical drawings, indications of standardized limits and fits on mechanical engineering drawings
30. Technical drawings, measurements
31. Technical drawings, numeric indication of non-standardized limits and fits on drawings
32. Technical drawings, special rules for measurements on mechanical engineering drawings
33. Technical drawings, special statement of dimensions on engineering drawings
34. Technical drawings, statement of dimensions
35. Technical drawings, symbols on mechanical engineering drawings, finish marks
36. Technical drawings, symbols on mechanical engineering drawings, gear wheels
37. Technical drawings, symbols on mechanical engineering drawings, threads, screws, and nuts
38. Technical drawings, symbols on engineering drawings, special finish marks

Germany

39. Beam flanges for jute looms in halves
40. Beam flanges of malleable iron, undivided
41. Beam flanges of steel plate with coupling sleeve and brake ring
42. Bumpers for passenger automobiles, design, position, and principal dimensions
43. Flexible shafts, connection with the driving motor, electrical machinery
44. Introduction of standards, automobile construction
45. List of DIN standards as of February, 1931, automobile construction
46. Piston rings for cast-iron pistons, automobile construction
47. Piston rings for light metal pistons, automobile construction
48. Warp beams for buckskin looms
49. Weaver's beams for jute looms
50. Wire rope for mining operations for brake winch and similar purposes

Great Britain

51. Diamond pyramid hardness numbers
52. Ebonite for electrical purposes
53. Electric cut-outs, type C
54. Electrical performance of high-voltage bushing-insulators
55. Forms and dimensions of boiler rivets (as manufactured) (1/2 inch to 2 inch diameter)
56. Galvanized mild steel cold water cisterns and hot water tanks and cylinders
57. Letter symbols for use in electrotechnics
58. Mains, supply apparatus for radio and acoustic reproduction for use on alternating-current mains
59. Phosphor bronze castings for gear blanks
60. Portland cement
61. Proportioning and testing of transformer inter-turn insulation
62. Street lighting
63. Tubular traction poles
64. Vegetable tanned leather belting

Australia

65. Calcium carbide
66. Compressed gas cylinders
67. Electrical performance of transformers for power and lighting
68. Pump test code
69. Road gully gratings
70. Sheet metal fittings for exteriors of buildings
71. Vegetable tanned leather belting
72. Wiring rules

Belgium

73. Specifications for insulated conductors for overhead lines

ASA PROJECTS

A Review of Mechanical Engineering Projects under ASA Procedure

The fourth of a series of reviews of standardization projects under the procedure of the American Standards Association

A review of progress in mechanical engineering projects since the report published in the February, 1931, issue of the ASA BULLETIN is given below. The review is based on the status of the projects as known to the ASA office on January 15, 1932. This review covers all of the mechanical engineering projects with the exception of the safety codes, which were reviewed in the November, 1931, issue of the BULLETIN.

The personnels of the committees handling the projects may be found by reference to the project section of the 1931 American Standards Association *Year Book* (pages 36–48).

B1—Standardization and Unification of Screw Threads

Sponsors—American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman—Ralph E. Flanders, Jones & Lamson Machine Company, Springfield, Vt.

Vice-Chairman—Frank O. Wells, Wells Manufacturing Company, Greenfield, Mass.

Secretary—Earle Buckingham, Massachusetts Institute of Technology, Cambridge, Mass.

Scope—Nomenclature of screw threads; form of threads; diameters and pitches of screws for various uses; classification of thread fits; tolerances and allowances for threaded parts; the gaging of threads; but not including threads for fire-hose couplings.

In 1924, the original sectional committee completed the American Standard B1a-1924 on Screw Threads for Bolts, Machine Screws, Nuts, and Commercially Tapped Holes, developed in cooperation with the National Screw Thread Commission. When reorganized in 1929, the committee decided to make a field survey of present screw-thread practice, especially with a view to the tolerances on threaded products given in the American Standard B1a-1924. This survey was made, the expenses being jointly met by the Engineering Foundation, the National Bureau of Standards, Sectional Committee B1, and a number of industrial firms making or using threaded products. Samples numbering 1579, each consisting of 5 pieces, were collected from 128 manufacturers and users and mailed to the Bureau of Standards to be gaged. This has now been done for the screws and bolts, and work on the nuts is going forward. The sponsor bodies intend to publish a comprehensive summary of the measurements, which are of the greatest importance, as they will furnish a basis for continuing work on several subdivisions of the committee's program.

Subcommittee 3 on Special Threads and the Twelve-Pitch Series (except Gages) met in April, 1931, and recommended the establishment of a series of 12-pitch threads with tolerances suitable for general-purpose applications (rather than for railway practice), the tolerances on the threads in the nuts to be given in accordance with Class 2 fit, and the tolerances on the screws in accordance with Class 2 and Class 3 fits. This committee also recommended—dealing with this matter upon a request from the piping industry—the setting up of a series of 8-pitch threads for diameters from 1 to 3 inches, inclusive, the sizes from 1 to 2 inches, inclusive, to step up by $1/8$ inch, and the larger sizes by $1/4$ inch. Tolerances according to Class 2 and Class 3 fits were recommended for the bolts and studs, and Class 2 tolerances for the nuts. The 8-pitch threads for the diameters of $1\,3/8$, $1\,5/8$, and $1\,7/8$ inch (which diameters do not appear on the present standard B4a-1924) take care of the needs of the piping industry for these sizes in making flanged pipe connections. (See also project B18—Bolt, Nut, and Rivet Proportions.)

A new subcommittee on Wood Screws was organized, which held a meeting and canvassed the wood screw manufacturers with a proposal that the minor diameter of the screws be made 65 per cent of the major diameter, with a permissible variation of plus or minus 4 per cent. No decision has as yet been reached.

One of the other problems under consideration is the extension of the fine thread series to diameters above $1\,1/2$ inch. This matter is of particular interest to the automotive industry.

No draft standards were published in 1931 for general criticism and comment.

B2—Pipe Thread

Sponsors—American Gas Association; American

Society of Mechanical Engineers.

Chairman—Edwin M. Herr, Westinghouse Electric & Manufacturing Company, New York.

Vice-Chairman—Stanley G. Flagg, Jr., Stanley G. Flagg Company, Philadelphia.

Scope—Dimensions of the elements of the American (Briggs) standard taper and straight pipe thread, plumbers' thread, threads for rigid electrical conduit and threads for thin tubes; formulas for calculating the dimensions of the threads; gage and working tolerances; methods of gaging the threads.

Progress made in the work on Taper Pipe Threads has consisted mainly in a rearrangement of the data contained in the American Standard for Pipe Thread (B2-1919) and in the method of gaging taper thread. The existing standard B2-1919 gives specifications for basic plug and ring gages only, and the subcommittee has now recommended that limit gages of the plug-and-ring type indicating the tolerance of plus and minus one turn, as well as the basic size, be added. The revision of the standard will not, however, disturb interchangeability with existing standard taper pipe threads.

An interesting point under discussion is whether it will be possible to unify the thread lengths of the existing American Standard taper threads as generally used for steam, gas, and water pipes, fittings, and valves, on the one hand, and the greater thread lengths of the corresponding A.P.I. taper pipe threads according to A.P.I. Standard 5 L, 1931, used for pipe lines for oil, etc., on the other.

Work on plumbers' threads is still going on. This involves, among other things, the question whether a change from 27 threads per inch to 28 should be made for plumbers' fine threads as cut on non-pressure brass and copper tubing. Furthermore, it concerns the threads for brass and copper concealed waste piping, for which 20 threads per inch have been tentatively recommended. Discussion of threads for corporation stops has also taken place.

In the matter of screw threads for rigid electrical conduit, a specification recently adopted by the conduit manufacturers is being submitted to the subcommittee concerned, for its consideration.

B3—Ball and Roller Bearings

Sponsors—American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman—F. W. Gurney, Gurney Ball Bearing Company, Jamestown, N. Y.

Secretary—R. S. Burnett, Society of Automotive Engineers, New York, N. Y.

Scope—Boundary dimensions of ball and roller bearing for radial and thrust loads or combinations thereof, as affecting the interchange or replacement of such bearings in machinery; and the tolerances on such dimensions.

An American Standard for single-row annular ball bearings and an American Recommended Practice for wide type annular ball and roller bearings were published in one pamphlet in 1930. Standardization of nomenclature for elements of annular and thrust ball bearings has since been under consideration, but recommendations on this subject have not been published for general comment, pending a report on nomenclature for roller bearings.

No American Standard on thrust bearings is expected to be developed by the sectional committee. This is due to the fact that the use of these bearings in the automotive industry is constantly decreasing. An SAE standard on the subject (revised in 1931) is supposed to take care of the uniformity in the sizes of thrust bearings as manufactured and stocked.

A very important development is a proposal concerning a series of standard tapered roller bearings that is now being submitted to the sectional committee for its approval. This series, which comprises 21 light, 19 medium, and 18 heavy bearings ranging in bore from $^3/_8$ to $4^1/_2$ inches, is meant to replace over 1000 stock bearings now extensively used. If and when this proposal is approved by the sectional committee it will also be submitted, as a proposed international series, to the Technical Committee on Ball and Roller Bearings organized under the procedure of the International Standards Association. In both the national and the international aspects this matter is of particular importance on account of the wide use of tapered roller bearings in the automotive and machine-tool industries, for example.

B4—Allowances and Tolerances for Cylindrical Parts and Limit Gages

Sponsors—American Society of Mechanical Engineers.

Chairman—Edward J. Kearney, Kearney-Trecker Corporation, West Allis, Wis.

Secretary—C. E. Rundorff, Research Engineer, Buick Motor Company, Flint, Mich.

Scope—Nomenclature and classification of fits between cylindrical parts, including allowances and tolerances for interchangeable manufacture; classification and fixing of standard tolerances for plain limit gages.

The sectional committee on this project, reorganized to review and, if necessary, revise the American Tentative Standard on Tolerances, Allowances, and Gages for Metal Fits (B4a-1925), held its first meeting in New York in December, 1930. The existing standard and the degree to which it had been adopted by and had given satisfaction to industry were discussed. On behalf of ASA a summary of existing foreign national standards on fits was submitted, together with a review of a proposal for international unification of the standards on this sub-

ject which are in course of development by a technical committee of the International Standards Association (ISA). It was decided that this proposal, when submitted, would be studied by the committee. In July, 1931, a report on the ISA proposal accompanied by a questionnaire was sent to the members of the sectional committee. This held its second meeting in December, 1931, where it was decided that a working committee should be appointed to deal with the main problems at present under consideration. One of these is the addition of a basic shaft system to the basic hole system which now is exclusively given in the American Standard B4a-1925. This question is important because those requiring fits in a basic shaft system cannot use the existing American Standard. The working committee will also study the ISA proposal, to which the sectional committee in its December, 1930, meeting decided to give due consideration in order to determine to what extent it would be suitable for application in American industry. (The ISA proposal was published in the July, 1931, issue of the ASA BULLETIN, and in the August, 1931, issue of *Mechanical Engineering*.)

B5—Small Tools and Machine Tool Elements

Sponsors—American Society of Mechanical Engineers; National Machine Tool Builders Association; Society of Automotive Engineers.

Chairman—C. W. Spicer, Spicer Manufacturing Company, Toledo, Ohio.

Secretary—J. A. Anglada, president, Anglada Motor Car Corporation, New York, N. Y.

Scope—The standardization of the elements of machine tool construction and operation, and of tool and work-holding elements and associated appurtenances, including driving mechanisms that constitute an inherent part of the machine tool; and relating primarily to the use of machine tools on manufacturing operations in mechanical industry; sizes, capacities, and clearances of machine tools and of other work and tool-holding parts; length of stroke, travel, and other movements and adjustments; parts and elements for holding and adjusting, guiding, or aligning work or tools, including bolts and nuts, slots, bushings, and tapers; drills, taps, reamers, cutters, countersinks, chucks, jigs, etc.

Technical Committee 1—T-Slots. An American Tentative Standard for T-Slots, Their Bolts, Nuts, Tongues, and Cutters (B5a-1927) was approved by ASA in 1927. Some time ago, a manufacturer of milling machines suggested that the depth of engagement of the tongues be increased. This suggestion is still under consideration by the committee.

Technical Committee 2—Tool Holder Shanks and Tool Post Openings. No revision of the American Standard B5b-1929 on this subject is being considered at the present time.

Technical Committee 3—Machine Tapers. A subgroup has contiuned its work on the development of certain details connected with tapers, particularly of tangs, slots, and drift keys. A report on this work to the technical committee is expected to be ready soon. Also, it is hoped that the technical committee will be able to make a complete report on all matters connected with its work on machine tapers as soon as business conditions improve to a fair degree.

Technical Committee 4—Spindle Noses and Collets for Machine Tools. In April, 1931, a revised draft of a proposed American Standard for Lathe Spindle Noses (dated March, 1931) was distributed to industry for criticism and comment. Testing of the new types of spindle nose under workshop conditions is in progress and the committee expects to make a definite recommendation within the next few months. The work on this subject has been correlated with that of the Technical Committee on Chucks and Chuck Jaws in so far as the dimensions of the contact surfaces of the chuck and the spindle end are concerned.

Technical Committee 5—Milling Cutters. The American Standard for Milling Cutters, Nomenclature, Diameters, Thickness, and Other Important Dimensions (B5c-1930) was approved by ASA in 1930. So far, no comments have been received that appear to call for a revision of the standard at the present time.

Technical Committee 6—Designations and Working Ranges for Machine Tools. This committee held a meeting where the outlining of a program of work was considered. It was decided that the first subject taken up would be the standardization of the designations and working ranges for planers, engine lathes, cylindrical grinders, milling machines, and radial drills. A canvass of manufacturers was planned for the purpose of collecting data.

In respect to designation of machine tools, the committee favored their designation by the dimensions of the piece that can be machined, or by the travel of the tool-holding or work-holding elements.

In the matter of working ranges of machine tools, the committee was of the opinion that the rate of production and the degree of accuracy of the work produced are proper subjects for standardization.

A statement expressing the above views was transmitted to various producers of machine tools, but no further action has so far been taken.

Technical Committee 7—Twist Drill Sizes. This committee is reviewing such comments as are received on proposal "C" on twist drill sizes and lengths distributed to industry in February, 1930. The recommendations contained in the proposal have been put into actual practice by several large users of drills. No meeting of this committee was held, due to the depression.

Technical Committee 8—Drill Jig Bushings.

The committee has reached unanimous agreement on the dimensions and tolerances for headless and head press fit bushings; liner bushings; knurled head slip bushings; and nomenclature, as contained in the tentative proposal of June, 1930. A suggestion for a change in the proposed hole size limits is under consideration and it is intended to distribute the proposal for criticism and comment when this question has been settled.

Technical Committee 9—Punch and Die Holders. A proposed standard covering styles, types, and size groups, and dimensions for punch and die holders were completed to the point where it is now practically ready to be distributed to industry for general criticism and comment.

Technical Committee 10—Circular Forming Tools and Holders. This committee held its organization meeting in March, 1931, after which each member received a questionnaire covering the design and proportions of circular and dovetail forming tools. At a later meeting, it was decided also to standardize dovetail forming tools, and, furthermore, to consider both automatic screw machines and hand screw machines. However, the latter will be dealt with later, after more progress has been made in regard to automatic screw machines. When analysis of the replies to the questionnaire has been completed, a tentative draft will be distributed among the large users of the tools concerned and among the manufacturers of machine tools in which they are used.

Technical Committee 11—Chucks and Chuck Jaws. A proposed American Standard for Rotating Air Cylinders and Adapters was published for general criticism and comment in January, 1931. A final draft, revised on the basis of comments received, was released in December, 1931, to letter ballot of the entire sectional committee for approval.

A proposed American Standard on Chucks and Chuck Jaws was published for general criticism and comment in March, 1931. On account of the comments received, a subgroup of three members started a revision of the draft, cooperating closely with Technical Committee 4 on Spindle Noses and Collets.

Technical Committee 12—Cut and Ground Thread Taps. After the approval, in 1930, of the American Standard for Taps, Cut and Ground Threads (B5e-1930), the committee took up work on ground thread pulley taps; cut thread bent shank tapper taps; ground thread bent shank tapper taps; cut thread straight shank tapper taps; machine screw sizes; cut thread taper pipe taps; and cut thread straight pipe taps. During the end of the year 1931 a draft was brought near completion, but the committee still wanted to get an opinion on certain questions from industry. To this purpose, a questionnaire will be sent out shortly.

Technical Committee 13—Splines and Splined Shafts. Two subgroups are working on this subject, one on splines for machine tools, and the other on splines for automotive use. The former subgroup has practically completed a tentative proposal, and when a similar proposal has been developed by the other subgroup, the two drafts will be studied by the entire technical committee to see whether the requirements of the two industries can be met by a single standard series.

Technical Committee 14—Electric Welding Dies and Electrode Holders. The committee's work has progressed to the point where it is felt that the various types of electrode bodies and tips for electric resistance welding machines can be reduced to a small number, and that two series, one with a taper fit and one with a thread attachment, may be sufficient. Samples of these two types are being tested by various factories in order to determine their opinion because the welding machine manufacturers are willing to abide by the decision of the welding machine users. It is expected that the committee may be able to arrive at a final recommendation during the spring or summer of 1932.

Technical Committee 15—Milling Machine Tables. A proposal for table widths was considered but found to be of no great importance. Value was placed, however, on the spacing of T-slots for five different ranges of table widths. The width and other dimensions of T-slots have already been laid down in the American Tentative Standard for T-slots, Their Bolts, Nuts, Tongues, and Cutters (B5a-1927). A draft on this subject has been practically completed and will be sent to a number of industrial concerns for comment as soon as some minor points have been settled.

Technical Committee 16—Rotating Tool Shanks. A new committee on this subject was organized at the December, 1931, meeting of the sectional committee as the result of the submission by the ASA office to Committee B5 of a tabulation of foreign national standard values of squares as used on tool shanks and spindles of engines and machines—for the mounting of cranks or handwheels, for example. The new committee will deal with the standardization of such dimensions of rotary tools (drills, reamers, bits, etc.) as are not covered by other technical committees of Sectional Committee B5; that on machine tapers, for example. That is, it will not only consider squares for shanks of rotary tools, but also, for example, the shank diameters of round shank type reamers and of drills with cylindrical shanks.

Technical Committee 17—Nomenclature. A canvass among experts on nomenclature for lathe tools which was held in 1931 by the ASA office upon request of a foreign national standard-

izing body showed wide divergencies; for example, in such an important matter as the use of the designations "right hand" and "left hand." The need for standardization was thus evident. The matter was brought to the attention of Sectional Committee B5 which in its December, 1931, meeting decided to organize the above-mentioned new committee. This met a few days later and outlined a tentative program of work. Incidentally, a good example of standardization in this field is given by the American Standard for Milling Cutters: Nomenclature, Diameters, Thickness, and Other Important Dimensions (B5c-1930).

Technical Committee 18—Drill Head Spindles and Bearings. The organization of this new committee was also decided upon at the December, 1931, meeting of sectional committee B5, after the desirability of standardizing multiple spindle drill heads had been emphasized by a representative of a large automobile concern. Emphasis was laid on the considerable savings that will result from interchangeability between heads of old and new design in regard to spindles.

The standards completed by this sectional committee and finally approved by ASA are:

Dimensions of T-Slots, Their Bolts, Nuts, Tongues, and Cutters (B5a-1927)

Dimensions of Tool Holders, Shanks, and Tool Post Openings (B5b-1929)

Milling Cutters (B5c-1930)

Taps: Cut and Ground Threads (B5e-1930)

B6—Standardization of Gears

Sponsors—American Gear Manufacturers Association; American Society of Mechanical Engineers.

Chairman—B. F. Waterman, Brown and Sharpe Manufacturing Company, Providence, R. I.

Secretary—C. B. LePage, American Society of Mechanical Engineers, New York, N. Y.

Scope—Standardization of spur, helical, herring-bone, bevel, and worm gearing, covering general gear proportions; tooth form; mounting of gears; selection of materials; inspection of gears; nomenclature

Subcommittee 3—Nomenclature. A proposal for Gearing Nomenclature applying to spur, helical, herring-bone, bevel, and worm gears, adopted in May, 1931, by the American Gear Manufacturers Association, was submitted to this subcommittee for its consideration in September, 1931. It includes a complete set of symbols for all elements having a dimensional value, and also a series of abbreviations which may be used in engineering or sales correspondence and can be written on the typewriter (the symbols comprise Greek letters which do not answer the latter requirement). Three members of the Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Z10) were appointed by its chairman to cooperate with this subcommittee for the purpose of coordination of the work of Committees B6 and Z10.

Subcommittee 4—Spur Gear Tooth Form. A proposed American Standard for the Tooth Form of the 14 1/2-degree and 20-degree Full Depth Involute System was ballotted on by the entire sectional committee. After the comments received with these ballots have been reviewed, the proposed standard will be ready for submission to the sponsors, and if approved by them, for submission to ASA. When finally approved, the standard will be combined and printed in one pamphlet with the existing standard, Tooth Form of Spur Gears (B6b-1927).

Subcommittee 5—Helical Gears. A draft standard for herring-bone gears is being developed, and agreement on the fundamentals, with the exception of tooth load formulas, has been reached by the subcommittee. The work on tooth load formulas has been awaiting the completion of a series of tests at the Massachusetts Institute of Technology.

Subcommittee 8—Materials. A draft standard for gear materials and blanks developed by the subcommittee was approved by the Committee on Gear Materials of the American Gear Manufacturers Association. The draft is now being brought into shape for publication.

Subcommittee 9—Inspection of Gears. A draft proposal on this subject is still under consideration by the subcommittee.

B16—Pipe Flanges and Fittings

Sponsors—American Society of Mechanical Engineers; Heating and Piping Contractors National Association; Manufacturers Standardization Society of the Valve and Fittings Industry.

Chairman—Collins P. Bliss, associate dean, College of Engineering, New York University, New York.

Secretary—Albert C. Taylor, New York.

Scope—Dimensional standardization (exclusive of screw threads) and designation of materials for pipe flanges, and flanged and screwed fittings for pipes carrying steam, gas, air, ammonia, water, etc. The standardization of face-to-face dimensions of ferrous gate, globe, angle, and check valves having flanged connecting ends and WSP ratings of 125 and 250 lb per sq in.

Subcommittee 1—Cast-Iron Flanges and Flanged Fittings. Two new standards were finally approved during 1931: namely, Cast-Iron Pipe Flanges and Flanged Fittings for Maximum Hydraulic Working Pressure of 800 Lb per Sq In. (Gage) at Ordinary Air Temperature (B16b1-1931), and Cast-Iron Pipe Flanges and Flanged Fittings for Maximum Working Saturated Steam Pressure of 25 Lb per Sq In. (Gage) (B16b2-1931).

A draft standard for Ammonia Pipe Flanges and Flanged Fittings was developed by the subgroup dealing with this subject, and was approved by the Refrigerating Machinery Association. When agreement on certain editorial changes has been reached, the proposal will go to the entire membership of subcommittee 1.

Subcommittee 2—Screwed Fittings. The proposed standard for Pipe Plugs of Cast Iron, Malleable Iron, Cast Steel, and Forged Steel, distributed in October, 1930, for general criticism and comment, is still under consideration of the subcommittee in the light of the comments received.

Subcommittee 3—Steel Flanges and Flanged Fittings. Considerable progress has been made toward the revision and supplementing of the American Tentative Standard on Steel Pipe Flanges and Flanged Fittings for Maximum WSP of 250, 400, 600, 900, and 1350 Lb per Sq In. (Gage) at a Temperature of 750 Degrees Fahrenheit (B16e-1927). Agreement has been reached on the re-rating of the 250 lb standard to 300 lb, and of the 1350 lb standard to 1500 lb. For the existing 250 lb standard, this involves an increase in metal thickness for certain types and sizes, but all other dimensions will remain the same. For the existing 1350 lb standard, the metal thickness will be increased and for sizes in this series larger than four inches, the flange thickness will also be revised.

Other proposed additions to the existing standard concern the following: steel companion flanges for 150, 300, 400, 600, 900, and 1500 lb steam pressure; and steel flanged base fittings for 300, 400, 600, and 900 lb steam pressure. Draft standards on these subjects have been distributed for general criticism and comment.

Subcommittee 5—Face-to-Face Dimensions of Ferrous Flanged Valves. Tables of center-to-face dimensions of flanged wedge gate valves, globe valves, and angle valves were developed by the Manufacturers Standardization Society of the Valve and Fittings Industry, one of the sponsor bodies for project B16. They were submitted as a proposal to Subcommittee 5 for approval and were recently distributed as a proposed American Standard for general criticism and comment.

Subcommittee 6—Malleable Iron or Steel Brass Seat Unions. The work of this subcommittee has been limited to the consideration of the tolerances and allowances proposed by the Subcommittee on Locomotive Design and Construction of the American Railway Association for unions for a minimum steam pressure of 300 lb per sq in. (so-called "heavy" unions). This matter is still in the hands of a subgroup of the subcommittee composed of manufacturers of unions.

Subcommittee 8—Marking of Pipe Fittings. Late in 1929 a questionnaire on "Marking" was sent out by this subcommittee to which a good response was received. Action has been postponed, however, pending the results of an investigation of this subject by the Manufacturers Standardization Society of the Valve and Fittings Industry, one of the sponsors of the work of Sectional Committee B16.

Subcommittee 9—Port Openings. This new subcommittee was appointed in April, 1931, in order to investigate certain questions raised by a manufacturer in regard to the port openings specified in the standard on Steel Pipe Flanges and Flanged Fittings (B16e-1927).

Some progress has been made by correspondence toward the definition of the scope of its work.

Bolts and nuts for flanged pipe connections. Close cooperation with Sectional Committee B18 on Bolt, Nut, and Rivet Proportions was effected through a joint Committee consisting, of three members each of committees B16 and B18. This resulted in a recommendation by Subcommittee 2 (of Committee B16) on Wrench-Head Bolts and Nuts and Wrench Openings that series of "heavy" bolt heads and nuts with dimensions commonly designated as "U. S. Standard" should be added to the American Tentative Standard B18b-1927. (See also report on the work of Sectional Committee B18.)

The standards completed by this sectional committee and finally approved by ASA are:

Cast-Iron Pipe Flanges and Flanged Fittings for Maximum WSP of 125 lb (B16a-1928)

Cast-Iron Pipe Flanges and Flanged Fittings for Maximum WSP of 250 lb (B16b-1928)

Cast-Iron Pipe Flanges and Flanged Fittings for Maximum WSP of 25 lb (B16b2-1931)

Malleable-Iron Screwed Fittings for Maximum WSP of 150 lb (B16c-1927)

Cast-Iron Screwed Fittings for Maximum WSP of 125 and 250 lb (B16d-1927)

Steel Pipe Flanges and Flanged Fittings for Maximum WSP of 250, 400, 600, 900, and 1350 lb (B16e-1927)

Cast-Iron Long Turn Sprinkler Fittings (B16g-1929)

B17—Standardization of Shafting

Sponsor—American Society of Mechanical Engineers.

Chairman—C. M. Chapman, consulting engineer New York.

Secretary—C. B. LePage, American Society of Mechanical Engineers, New York.

Scope—Diameters of transmission and machinery shafting and tolerances on shafting stock; choice and proportions of shafting keys and tolerances for key stock; development of standard formulas and methods to be used in determining transmission shafting sizes.

Considerable progress has been made in the revision of the following four standards which will be republished in a single pamphlet:

Diameters and Lengths of Cold-Finished Shafting (B17a-1924)

Standard Widths and Heights of Square and Flat Stock Keys (B17b-1925)

Square and Flat Plain Taper Stock Keys (B17d-1927)

Square and Flat Gib Head Taper Stock Keys (B17e-1927)

Printer's proof copies of the proposed revision (dated March, 1931) were submitted to the members of the sectional committee and discussed in meetings held in October and November, 1931, on which occasions certain changes in the draft were made. The recommendations for the revised edition of the standards (not yet published for criticism) are now as follows: No change in the tabulated dimensions of B17a-1924 is considered, but an extension of the series of shafting diameters to eight inches, inclusive, is proposed. A questionnaire to be sent out to industry on this matter will also concern the increments in shaft diameter. The term "*cold* finished" will be abolished and it will be made clear that the shafting referred to belongs to one of three types: cold-drawn; turned and polished; or turned, ground, and polished.

Two key sizes ($^5/_{16}$ in. square and $^5/_{16} \times {}^1/_4$ in. flat) are proposed to be added to those given in the existing standards B17b-1925, B17d-1927, and B17e-1927. In B17b-1925 it is also proposed to add the depth of insertion of the key into the shaft. A new table giving a series of nine large flat keys in sizes from $1^1/_2 \times 1$ in. to 6×4 in., but not matched to any particular shaft diameters, is also proposed to be added.

The revised standard will emphasize that the "stock" keys referred to are those commonly used, for example, in transmission shafting and supposed to be readily available from the manufacturers or distributors. "Fitted" keys, as required in more refined machinery and calling for closer tolerances (or a plus, instead of a minus, tolerance on key widths) do not fall within the scope of the work of this sectional committee.

Other standards completed by this sectional committee and finally approved by ASA are:

Code for Design of Transmission Shafting (B17c-1927)

Woodruff Keys, Keyslots, and Cutters (B17f-1930)

B18—Bolt, Nut, and Rivet Proportions

Sponsors—American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman—Arthur E. Norton, associate professor, Harvard University, Cambridge, Mass.

Secretary—William J. Outcalt, Standards Section, General Motors Corporation, Detroit, Mich.

Scope—Standardization of dimensions, material, and nomenclature of rivets, hexagonal and square head bolts and nuts, slotted head bolts, and machine screws; track bolts, carriage bolts, and special bolts and nuts for agricultural machinery; but not including the standardization of screw threads.

Subcommittee 1—Large and Small Rivets. Comments received on the proposed Amercian Standard on Large Rivets published for general criticism and comment in March, 1929, led to a revised draft which is still in the hands of the subcommittee.

Subcommittee 2—Wrench Head Bolts and Nuts, and Wrench Openings. A revision and supplementing of the American Tentative Standard on Dimensions of Wrench-Head Bolts and Nuts, and Wrench Openings (B18b-1927) is nearing completion. The revision concerns mainly a change in the width across flats and the thickness of certain types and sizes of nuts, to which all parties concerned have agreed. (These changes were made by the A.S.M.E. in a new edition of the standard printed some time ago, but have not yet been formally approved by ASA; see ASA BULLETIN, August, 1931, page 29.)

One of the most important additions recommended is that of a series of American Standard heavy bolt heads (range from $^1/_4$ inch to 3 inches), and a series of American Standard heavy nuts (range $^1/_4$ inch to 4 inches). The existing standard gives "regular" and "light" series of bolt heads and nuts only.

The dimensions of the proposed heavy bolt heads and nuts will correspond to those commonly designated as "U. S. Standard." Their addition to the existing standard is largely due to the insistence of the manufacturers and users of pipe flanges and flanged fittings who claim that the existing American Standard regular bolt heads and nuts (Tables 1 and 5, B18b-1927) are too small for flanged pipe connections on account of the clearance required between the bolt and bolt hole. The piping industry has, in fact, continued generally to use the heavy bolts and nuts. The railways also use the heavy nuts for example, in locomotive construction and for track bolts.

In accordance with the wishes, particularly of the piping industry, the inclusion of heavy bolt

heads and nuts for the nominal sizes $1^3/_8$, $1^5/_8$, and $1^7/_8$ inches was recommended by the subcommittee. These sizes are extensively used with 8-pitch threads in this industry. The addition of threads for the three sizes in question to the American Standard on Screw Threads for Bolts, Machine Screws, Nuts, and Commercially Tapped Holes (B1a-1924) has been strongly recommended to Sectional Committee B1 on Screw Threads. (See also report on project B1.)

Table 8 of the existing standard B18b-1927, which gives dimensions of light nuts in sizes from $^1/_4$ to $^1/_2$ inch, has been found not to cover the entire range used by the automotive industry. A draft for an extension of the series to the size $1^1/_2$ inches, inclusive, was recommended by Subcommitee 2. Furthermore, Table 10, of the same standard, dealing with castle nuts in sizes from $^1/_4$ to $1^1/_2$ inches, was found to be at variance with automotive practice for sizes over $^9/_{16}$ inch. A revision of the table to remove this lack of agreement was, therefore, recommended by the subcommittee. Also, the addition of nine sizes in Table 11, on Wrench Openings, was recommended in connection with the above-mentioned changes and additions in bolt head and nut sizes.

The addition of a series of Heavy Slotted Nuts and Extra Thick Slotted Nuts is under consideration.

A reduction in the nominal thickness of semi-finished nuts and bolt heads by such an amount as to permit the production of semi-finished bolts and nuts from unfinished, without the former being likely to get below the low limit of the nut or head thickness, was recommended. Incidentally, the term "unfinished" was recommended to replace the term "rough" in the tables of the existing standard B18b-1927.

Subcommittees 3, 4, 5, and 6. Subcommittee 3 on Slotted Head Proportions; 4, on Track Bolts and Nuts; 5, on Round Unslotted Head Bolts (Carriage Bolts); and 6, on Plow Bolts, have no revision of the standards developed by them and approved by ASA under consideration at the present time.

Subcommittee 9—Socket Head Cap and Set Screws. A proposed standard for Socket Type Set and Cap Screws is expected to be published in the near future for general criticism and comment.

The standards completed by this sectional committee and finally approved by ASA are:

Small Rivets (B18a-1927)

Dimensions of Wrench-Head Bolts and Nuts and Wrench Openings (B18b-1927)

Slotted Head Proportions: Machine Screws, Cap Screws, and Wood Screws (B18c-1930)

Track Bolts and Nuts (B18d-1930)

Dimensions of Round Unslotted Head Bolts (B18e-1928)

Dimensions of Plow Bolts (B18f-1928)

Tinners', Coopers' and Belt Rivets (B18g-1929)

B26-1925—Screw Threads for Fire-Hose Couplings

Sponsors—American Society of Mechanical Engineers; American Water Works Association; National Board of Fire Underwriters.

Scope—Threaded parts of fire-hose couplings, hydrant outlets, stand-pipe connections, Siamese connections, and all other special fittings on fire lines where fittings of $2^1/_2$, 3, $3^1/_2$, and $4^1/_2$ inches nominal diameter are used.

The use of this standard is constantly increasing. More than 3900 cities and towns, located in 40 states and the District of Columbia, have adopted it. The states of Oregon, Massachusetts, Texas, Maryland, and California (in June, 1931) have passed legislative bills prohibiting the sale, purchase, or use of any fire-fighting apparatus which does not conform to this standard.

B27—Plain and Lock Washers

Sponsors—American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman—C. W. Squier, associate editor, *Mechanical Engineering*, New York.

Secretary—Fred Doepke, Wrought Washer Manufacturing Company, Milwaukee, Wis.

Scope—Cast-iron and malleable-iron plain washers and steel lock washers and plain washers.

Subcommittee 2 completed a proposed American Tentative Standard on Lock Washers (dated November, 1931) which was published for general criticism and comment in December, 1931. It lists lock washers for a number of wrench-head bolt heads and nuts as given in the American Standard B18b-1927, and for machine screws as given in the American Standard B18c-1930.

No progress can be reported on Plain Washers.

B29—Transmission Chains and Sprockets

Sponsors—American Gear Manufacturers Association; American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman—F. V. Hetzel, West Chester, Pa.

Secretary—G. M. Bartlett, West Lafayette, Ind.

Scope—Formulation of American Standards for transmission roller chains and sprocket teeth, based on the standards already adopted by the Society of Automotive Engineers, the American Society of Mechanical Engineers, and the American Gear Manufacturers Association; and the study of the

possibilities of standardizing the so-called silent type of transmission chains and sprockets.

An American Standard for Roller Chains, Sprockets, and Cutters (B29a-1930) was approved in 1930. The problem of standardizing silent chains has appeared to be subject to much greater difficulties. No progress in this line can be reported.

B31—Code for Pressure Piping

Sponsor—American Society of Mechanical Engineers.

Chairman—Edwin B. Ricketts, New York Edison Company, New York.

Secretary—Frederick A. Lydecker, general superintendent of distribution, Public Service Electric & Gas Company, Newark, N. J.

Scope—Design, manufacture, test, installation, and operation of pressure piping systems.

In December, 1931, the sectional committee held a meeting in New York where reports on the different sections of the work were submitted. The final completion of several draft standards is waiting for the report of the Committee on the Pipe Thickness Formula which was appointed to confer on this matter with the A.S.M.E. Boiler Code Committee in order to harmonize the formulas adopted by the two committees (the Piping Code Committee and the Boiler Code Committee).

Subcommittee 2—Power Piping. A draft standard developed by this subcommittee and previously published for general criticism and comment was adopted in revised form by the sectional committee, the report of the Committee on Pipe Thickness to be included when available.

Subcommittee 4—Gas and Air Piping. The draft standard previously published for general criticism and comment was revised in minor details. Some changes have been suggested by the Natural Gas Group. Finding that clarification of these suggestions might take considerable time, the sectional committee adopted the draft with the exception of the portions relating to natural gas, and to the pipe thickness formula (see Subcommittee 2).

Subcommittee 5—Refrigerating Piping. This subcommittee had nothing definite to report, but is making progress.

Subcommittee 6—Oil Piping. The draft standard previously published for general criticism was adopted, with minor changes, by the sectional committee, subject to later inclusion of the pipe thickness formula.

Subcommittee 8—Fabrication Details. The work on this section is dealt with by five subgroups, on pipe hangers, supports, anchors, etc.; on joints other than welded; on pipe bends; on power piping; and on welding. A draft standard has been published for general comment.

The chapter on pipe hangers, supports, anchors, etc., and that on pipe joints other than welded, were adopted by the sectional committee in its December, 1931, meeting, the latter with certain changes made during this meeting. A considerable amount of work has been done on the Welding Code dealing with the welding of pressure piping. This chapter was not yet ready for submission to the sectional committee at the December meeting but it was generally discussed on that occasion.

Subcommittee 9—Code for District Heating Piping. A draft code developed by this subcommittee, but not yet published for general criticism and comment, was submitted to the sectional committee and adopted. This draft has also been approved by the National District Heating Association.

B32—Wire and Sheet Metal Gages

Sponsors—American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman pro tem—W. H. Hutchins, North East Electric Company, Rochester, N. Y.

Scope—The standardization of a method of designating the diameter of metal and metal alloy wire, the thickness of metals and metal alloys in sheet, plate, and strip form and wall thickness of tubing, piping, and casing made of these materials; and the establishment of a standard series, or standard series, of nominal sizes and of tolerances for wires, sheets, plates, and strips.

In its organization meeting held in November, 1928, the sectional committee appointed three Technical Committees: 1. Flat Stocks; 2. Wires and Rods; and 3. Tubing, Piping, Conduit, and Casing.

No progress can be reported for any of these subcommittees.

B33—Hose Coupling Screw Threads (Nominal Sizes 1/2 to 2 In., Inclusive)

Sponsor—American Society of Mechanical Engineers.

Chairman—H. W. Bearce, Bureau of Standards, Washington, D. C.

Secretary—Arthur L. Brown, engineer in charge, Factory Mutual Laboratories, Boston, Mass.

Scope—Nominal values and manufacturing limits for the dimensions of screw threads for small hose couplings ranging from one-half inch to two inch nominal size, and for hose couplings, other than fire-hose couplings, with a nominal size larger than two inches.

A proposed American Standard on Hose Coupling Screw Threads for All Connections Having Nominal Inside Diameters of 1/2, 5/8, 3/4, 1, 1 1/4, 1 1/2, and 2 Inches was developed. It proposes two series of hose coupling threads, one to be used for general industrial services (air, steam, water, etc.) and the other, with coarser pitches, for fire hose (also chemical fire-engine hose) and garden hose. The draft was discussed

at the December, 1931, meeting of the sectional committee and a somewhat revised draft is now being prepared for further discussion by the committee.

B36—Standardization of Dimensions and Material of Wrought Iron and Wrought Steel Pipe and Tubing

Sponsors—American Society of Mechanical Engineers; American Society for Testing Materials.

Chairman—Harold H. Morgan, manager, Rail and Fastenings Department, Robert W. Hunt Company, Chicago, Ill.

Secretary—Sabin Crocker, Engineering Division, Detroit Edison Company, Detroit, Mich.

Scope—Standardization of the design, dimensions, and material of welded wrought iron pipe, of welded and seamless steel pipes, and of boiler tubing, including pipe and tubing for high temperatures and pressures.

A basic formula for determining the wall thickness of pipes for various conditions of internal pressure and allowable stress in the pipe material was adopted by the sectional committee. (This formula was taken over by the Sectional Committee on the Code for Pressure Piping. See project B31.) The elimination of $3^1/_2$ in. pipe heavier than so-called "extra strong" was recommended after consultation with the Sectional Committee on Pipe Flanges and Fittings (B16).

A proposed American Tentative Standard on Wrought Iron and Steel Pipe for Service at a Maximum Temperature of 450 F was developed and discussed in a joint meeting in December, 1931, of Subcommittees 2 and 3, dealing with Pipe and Tubing for Low Temperature Service, and for High Temperature Service, respectively. This proposal gives the wall thickness, weight, hydrostatic test pressure, and theoretical circumferential wall stresses (for 1000 lb internal pressure) of welded and seamless steel pipe, and of welded wrought iron pipe. It was sent, with the changes adopted in the meeting, to all members of the two subcommittees for an expression of their opinion on form and arrangement.

B38—Standards and Specifications for Refrigerators

Sponsors—American Society of Refrigerating Engineers; Bureau of Home Economics, U. S. Department of Agriculture.

Chairman—Charles H. Roe, Electrical Testing Laboratories, New York, N. Y.

Secretary—Florence B. King, Bureau of Home Economics, U. S. Department of Agriculture, Washington, D. C.

Scope—Inside cubic contents; area and spacing of shelves; dimensions of ice doors; cooperation with the Division of Simplified Practice in establishing outside dimensions; the development of such standard methods of test as will be necessary to establish the data required in determining the rating of refrigerators; specifications covering the more important data essential to the rating of refrigerators and appropriate for inclusion on a nameplate defining the leading characteristics of the box; the setting up of standard grades or qualities for refrigerators; due consideration of questions of ruggedness and durability.

Such standards and specifications are to apply to household types of refrigerators and to such domestic-type refrigerators as are used in hospitals and hotels; but not to ice-making machinery or other specialized types of equipment.

Such standards and specifications are to apply both to refrigerators cooled with ice and to self-acting or mechanical refrigerators employing a self-contained refrigerant.

A sectional committee consisting of 43 representatives of 30 national organizations and interested bodies recently completed a Code for Testing Refrigerators Using Ice (B38c1-1931), which was formally approved as American Recommended Practice in December, 1931. This is the first section of the specifications in process of preparation which will, when completed, form a comprehensive Standard for Iced Refrigerators. Three subcommittees are engaged in the preparation of material for further specifications, and Subcommittee 3, which was responsible for the drafting of the Code just completed, has already undergone reorganization for work on performance characteristics of automatic refrigerators. A meeting was held on January 15, 1932, and satisfactory progress is reported, so that a draft of test methods covering refrigerators operated by gas and by electricity may be expected within the next few months. The sectional committee has under consideration plans for a system for making results of tests available in the form of nameplates or labels in a standard form.

B40—Pressure and Vacuum Gages

Sponsor—American Society of Mechanical Engineers.

Chairman—M. D. Engel, Edison Electric Illuminating Company, Boston, Mass.

Secretary—A. W. Lenderoth, Crosby Steam Gage and Valve Company, New York.

Scope—Nomenclature and definitions of pressure and vacuum gages; capacity ratings; case sizes and mounting holes with a view to obtaining maximum interchangeability; dials and graduations and designation of units; indicator hand and bushing; zero stop pins; bezel rings and their attachment to the gage; connections to gages; method of expressing allowable errors or accuracy of the gage; requirements for accuracy in so far as establishment of such requirements proves to be feasible; methods of testing; rules and specifications for installation and use of pressure and vacuum gages.

Upon recommendation of Subcommittee 1 on Plan and Scope the appointment of three other subcommittees was decided upon. Subcommittee 2, in charge of developing definitions,

specifications, and rules for installation and use, recommended that for the time being the work should be confined to gages of the dial type, and circulated a questionnaire on this subject among the members of the sectional committee.

Subcommittee 3 is to deal with gage sizes and mounting dimensions (suggested list of preferred sizes); size and type of connections of gages and cocks; indicator hands (balance—interchangeability); stop pins (when and where to be used); bezel rings and methods of attachment; and safety features for high-pressure gages. It held its organization meeting in October, 1931, where ways and means of developing the work were discussed.

Subcommittee 4 on Accuracy and Test Methods decided tentatively to classify gages into four groups on the basis of the degree of accuracy required, as follows: A–Precision Gages; B–High-Grade Commercial Gages; C–Commercial Gages; and D–Approximate Pressure Indicators. Questions such as the relationship between working pressure and full-scale reading; degree of accuracy; and method of testing accuracy of gages were given consideration in a meeting held in December, 1931.

B41—Stock Sizes, Shapes, and Lengths for Iron and Steel Bars

Sponsor—American Society of Mechanical Engineers.

Chairman—F. H. Franklin, American Institute of Steel Construction, Inc., New York, N. Y.

Scope—The standardization of the dimensions of cross-sections and lengths of hot-rolled and cold-finished iron and steel bars having the following shapes: (1) rounds, (2) squares, (3) triangular sections, (4) hexagons, (5) octagons, (6) half-rounds, (7) half-ovals, (8) square-edged flats, (9) nut steel flats, (10) beveled cornered squares, including tolerances on the dimensions of such bars, (11) reinforcing bars. Nationally recognized standards are to be accepted where possible.

The personnels of the three subcommittees, on Hot-Rolled Steels, on Cold-Finished Steels, and on Hot-Rolled Iron, have been completed. The Subcommittee on Cold-Finished Steels held its organization meeting in October, 1931, and decided to use the manufacturers' standard practice as the basis for its first proposals for shapes, dimensions, and tolerances.

B42—Leather Belting

Sponsor—American Society of Mechanical Engineers.

Temporary Chairman—J. C. Mattern, assistant superintendent, Singer Sewing Machine Company, Elizabethport, N. J.

Temporary Secretary—H. E. Whiting, president, Whiting Leather and Belting Company, Long Island City, N. Y.

Scope—Specifications for vegetable-tanned leather belting, including raw material, construction, marking, physical and chemical tests.

In January, 1931, the A.S.M.E. accepted sole sponsorship for this project and in May the sectional committee held its first meeting. Two subcommittees were appointed, one on Standard Specifications, and the other on Recommendations for Selection, Care, and Installation. The recommendations of the latter subcommittee will ultimately be embodied in an appendix to the Standard Specifications.

B43—Dimensions of Machine Pins

Sponsors—American Society of Mechanical Engineers; Society of Automotive Engineers.

Chairman—Myron E. Steczynski, chief engineer, Knight Soda Fountain Company, Chicago, Ill.

Scope—Dimensions of taper, split, straight, and dowel pins.

Comments received from industry, after publication of the proposed American Standard on Machine Pins (dated August, 1930) are under consideration by the sectional committee.

B44—Industrial Thermometers

Scope (*tentative*)—Specifications and standards governing construction, tolerances, and method of tests for industrial thermometers of the mercury-in-glass type.

Suggestions made by user and general interest groups that proposed specifications should be drafted by the manufacturers were referred in April, 1930, to the Scientific Apparatus Makers' Association for consideration and action. The matter is still in the hands of this body.

B45—Foundry Equipment

Sponsors—American Foundrymen's Association; American Society of Mechanical Engineers.

Chairman—E. S. Carman, temporary chairman, Edwin S. Carman, Inc., Cleveland, Ohio.

Scope—Standardization of such foundry equipment and supplies as pattern plates and molding machine parts affecting interchangeability of patterns, flask pins, and holes, general dimensions of flasks for jobbing work, ladle and ladle shank sizes, ladle sleeves, stoppers and nozzles, stock core print sizes, shapes and finish allowances, pattern markings, rapping plates, fillet sizes, and dowel pins for metal patterns and metal core boxes.

The organization meeting of this sectional committee was held in May, 1931. It was decided to divide the work among three subcommittees, as follows: 1. pattern plates, molding machine parts affecting interchangeability of patterns, flask pins and holes, general dimensions of stock flasks for jobbing work; 2. ladle and ladle shank sizes; ladle sleeves, stoppers, and nozzles; and 3. stock coreprint sizes, shapes, and finish allowances; pattern markings; rapping plates; fillet sizes; dowel pins for metal patterns and metal core boxes.

B46—Finishes on Machine Surfaces

A request that work on this subject be taken up by a sectional committee was made to ASA in October, 1931, by the American Society of Mechanical Engineers, this body offering to be sole or joint sponsor. The problem of determining and classifying the quality of a machined surface (turned, milled, ground, lapped, reamed, etc.) and of designating such quality in specifications and drawings has become increasingly important in the last few years. The request has been referred to a special committee whose recommendation is expected very shortly. Its consideration of the matter has opened interesting questions, such as whether the work should be confined to machined surfaces, or whether, for example, surfaces of castings and cold-finished shafting should also be dealt with. Another question is whether the project should be limited to metal parts, or whether parts made of glass, hard rubber, bakelite, etc., are to be comprised in the scope of work. Great interest has already been shown in the new project, which is not surprising if it is realized how large a number of industries are faced with the problems involved. Two interesting articles in this field, one by R. E. W. Harrison, and the other by R. C. Deale, were reprinted in the November, 1931, issue of the ASA BULLETIN.

B47—Plain and Thread Plug and Ring Gage Blanks

Standard specifications for Plain and Thread Plug and Ring Gage Blanks were developed in the course of recent years by the American Gage Design Committee. This is an informal group of experts representing important manufacturers and users of limit gages in the United States. For example, the automotive and electrical industries, and the War Department, are among the latter. The value of the work of this committee was also recognized by ASA, the National Screw Thread Commission, and the Bureau of Standards, and the latter body printed the American Gage Design Report as its Miscellaneous Publication 100. In January, 1932, this document, which has become widely adopted in practice, was submitted to ASA for approval as an American Standard. The request was referred to a special committee whose recommendation on approval is expected in the near future.

ASA Publishes Standard for Drainage of Coal Mines

American Recommended Practice for Drainage of Coal Mines (M6-1931) has been published by ASA and is available at 40 cents.

Standard for Rock Dusting in Coal Mines Widely Used

One of the most important of the mining codes included in the brief review of ASA mining projects in the December issue of the ASA BULLETIN is that for rock dusting of coal mines (M13-1925).

Rock dusting for coal mines as a major factor in minimizing the effect of coal-dust explosions in bituminous coal mines has now become well extended in American mining practice. Proposed to the Director of the U. S. Bureau of Mines by George S. Rice in 1910, its official approval in 1913 by the U. S. Bureau of Mines was the first obtained on a national scale; subsequently, the practice was adopted by several European countries. Since the approval of rock dusting in this country, a continuous campaign to promote its use has been carried on by Bureau engineers. The primary importance of rock dusting as a safety measure has now become well recognized, as in several instances explosions in rock-dusted mines have been localized, whereas without rock dusting these explosions might have been major disasters. A national code for rock dusting, based upon the recommendations of the U. S. Bureau of Mines and developed by a committee working under ASA procedure, with the American Institute of Mining and Metallurgical Engineers as sponsor, was a logical extension of these earlier efforts. Its provisions have proved uniformly acceptable.

ASA Approves Standard for Railway Control Apparatus

A standard for Electric Railway Control Apparatus (C48-1932), comprising a revision of that portion of the former standard for Railway Control and Mine Locomotive Control Apparatus (C36-1926) which dealt with railway control, has been approved as American Standard by ASA.

The standard applies to control apparatus for all electric railway applications including trackless trolleys and vehicles in which electric motors are used for propulsion. The provisions of the standard are divided into the following groups: service conditions; definitions; rating; heating; limitations other than heating; dielectric tests.

The revised standard was submitted for approval by the proprietary sponsor, the American Institute of Electrical Engineers.

Printed copies of the standard in final form are not yet available but copies of the draft as approved are available for loan through the ASA office.

American Standards Association Approves Code for Domestic Ice Refrigerators

The first step in the development of standards and specifications for domestic refrigerators has just been completed with the approval as American Recommended Practice of the Code for Testing Domestic Refrigerators Using Ice (B38c1-1932). This Code establishes a method whereby definite information may be obtained regarding the two essential elements in the performance of iced refrigerators—internal temperatures and rates of ice meltage. The Code further stipulates the method of expression of these test results in such terms as to render them intelligible to all. The development of the Code itself was in charge of a subcommittee of the sectional committee for project B38 entitled "Standards and Specifications for Refrigerators." The sponsors are the American Society of Refrigerating Engineers and the Bureau of Home Economics of the U. S. Department of Agriculture.

Temperatures within the refrigerator are measured at four locations—one in the milk compartment, which should be the coldest section, and the others at three points within the main body of the refrigerator. The temperature of the milk compartment is stated separately but the temperatures at the three other locations are averaged to derive a statement of average temperature in the "food compartment."

The rate of ice consumption is expressed in terms of meltage during 24 hours, beginning with a full charge of ice. The test is continued for record purposes through a period of at least three days, the record for each day being separated and those for the three days averaged to obtain the final statement.

From the beginning of this project representatives of consumers' interests and of manufacturers alike have stated repeatedly the urgent need for nameplates whereby reliable information regarding refrigerator performance could be made available to the purchaser. Having this in mind, the Code was so drafted as to produce the information wanted for this purpose and an introduction contains a safeguard clause setting forth the intention that performance data derived by means of this Code should not be stated in piece-meal fashion but should include in no case less than the following:

Room reference temperature

Internal temperatures

Ice melting rate

Name of individual or laboratory making the test

The Test Code calls for a room temperature of 75 F during the test, but there are recognized methods for readily converting the observed data with fair accuracy to represent performance at other room temperatures within a reasonable range.

At the request of the sponsors, the new standard will be published at once by ASA in standard form. It is hoped that with the Code now generally available efforts to provide nameplates or labels for the information of purchasers will be expedited. Discussions to this end are under way. There are already available standards for ice capacities and door openings, methods of measuring shelf areas and interior dimensions, and requirements as to internal temperatures. The recommendation by the Sectional Committee of a Standard for Iced Refrigerators, including all of these partial standards, is likely in the near future.

The same subcommittee that developed this first Code, with the addition for the purposes of this work of representatives of the organized manufacturers, is now engaged in the formulation of a Test Code designed to facilitate the determination of the performance characteristics of automatic refrigerators such as are operated by electricity, gas, or other forms of energy. Considerable progress has been made and the subcommittee hopes to produce something very helpful along this line within the next few months. The results of tests made in accordance with this Code would be available for statement on a nameplate or label at such time as arrangements could be made to institute such application.

CHARLES H. ROE
Chairman, Sectional Committee on Standards and Specifications for Refrigerators (B38)

Index to A.S.T.M. Standards

Copies of the new *Index to A.S.T.M. Standards and Tentative Standards* have just been received at the ASA office, and are available free of charge to those interested. The index is a booklet of over 100 pages and includes a price list of A.S.T.M. publications.

Why the Safety Code for Walkway Surfaces Has Not Been Completed

by

John W. Logan,[1]
Alanwood Iron and Steel Company

In the December, 1931, issue of the ASA BULLETIN appear two reprints of recent magazine articles relating to the Walkway Safety Code. "Fatalities Due to Falls Show Need for Walkway Safety Code" by C. W. Burke was reprinted from the *National Safety News*, October, 1931; "Safety Magazine Asks for Early Completion of Safety Code for Walkway Surfaces" by an anonymous author was reprinted from *Safety Engineering*, September, 1931. As reprinted, a considerable portion of Mr. Burke's paper as it originally appeared in the *National Safety News* has been inserted in the article from *Safety Engineering*, instead of in its proper place.[2]

The implication in the *Safety Engineering* article that conflicting commercial interests have delayed the perfecting and promulgating of a Walkway Surface Code is entirely unwarranted. Two serious obstacles in the completion of this work have been:

> First, the continued lack of reliable data as to when and where accidents due to slipping on walkway surfaces have occurred, and
>
> Second, the unsatisfactory and inconclusive results of the tests made at the Bureau of Standards.

The original purpose of the code was its development for minimizing the slipping and tripping hazard of pedestrians on walkway surfaces in public and semi-public locations. Some very fantastic figures as to the hazards of public walkways and as to the saving to the national wealth through the adoption of this code have been published. These figures, generally, have been based on the total number of accidents reported as "falls" throughout the country without eliminating accidents from "falls" of types and in locations where the proposed code would not be applicable. Accidents within the home (obviously not subject to the code) reported as "falls" are estimated variously from 50 per cent to 80 per cent of the total of all accidents from "falls." The lower figure is an estimate of the National Safety Council, the higher is the actual figure for the State of Kansas for the year 1930. As "falls" in homes are variously classified as "from chairs, tables; from ladders; when getting in or out of bed; in bathtubs; on floors, rugs, etc.; on stairs; over objects; etc.," their inclusion in any statistical discussion of the Code is not correct.

Included in general statistics of accidents to pedestrians due to "falls" in public or semi-public places are those "from platforms, wharves; into ditches, trenches; into trap doors, manholes; over objects; on uneven ground; on ice." The Coronor of Philadelphia has stated that more than half of all "falls" of pedestrians reported in that city occur in winter time due either to ice or slippery conditions of the streets or to snow or ice on shoes when entering public buildings. In the December, 1931, issue of *National Safety News*, Harold T. Martin under the heading "The Most Irritating Safety Problem" gives numerous instances of "falls" when walkway surfaces were not involved at all.

In 1926 a Subcommittee of the Walkway Code Committee, on which no manufacturer was represented, included in its report the following statement:

> "The secretary has made a conscientious effort to obtain information regarding the condition and character of walkway surfaces on which accidents have occurred and the results in his files are negligible. The wide circularization by the secretary and the Bureau of Standards leads to *the inevitable conclusion that such data are not available.*"

Unfortunately, practically the same conditions exist today, at the beginning of 1932, in regard to reliable data as existed in 1926.

A concerted effort has been made to make it appear that, if all the data secured during the tests at the Bureau of Standards were published in full detail, the problem would be solved. It should be remembered that when this matter was referred to the Bureau of Standards originally it was submitted as a pure research problem and no one knew what direction the experiments

[1] Mr. Logan is the representative of the Association of American Steel Manufacturers on the Sectional Committee on Safety Code for Walkway Surfaces (A 22).

[2] See correction note, page 80.

might take. Manufacturers of various walkway materials were asked to contribute to the cost of this work, which they did by paying it all. The original committee which started this work in Washington asked manufacturers to submit samples of walkway materials for experimental work only and volunteered a pledge that no details of results on individual materials would be published. A serious objection to using figures developed during these experiments for establishing a permanent measurement of suitability of different materials was the fact that such action would not do justice to future improvements in the quality of the materials tested.

Many of those who have followed in detail Dr. Hunter's work in Washington feel that it has not been demonstrated that tests by this method are a true measure of a suitability of walkway materials. This position is confirmed in the report itself, *Research Paper No. 204*, from which the following is quoted:

> "The measurements on clean, dry surfaces show a reproducibility which would justify the assumption that the coefficient of friction of a material represents approximately its antislip value when the surface is clean and dry. However, it should be noted that some walkway materials tend to become slippery when the surfaces are dirty or wet or oily and that *this tendency bears no relation to the coefficients of friction on clean dry surfaces. Though these data would enable a rough rating of walkway materials* in respect to their antislip values under each of the simulated service conditions, *their direct application to a safety provision for walkway surfaces seems to be limited*, unless the method is further developed and the friction measurements are correlated with the slipping hazard of walkways in actual service.
>
> "The spread in different determinations of the coefficient of friction of the same material, and the possible error in determining the minimum coefficient needed for safety from the meager data available are too great in comparison with the total range in the coefficients of friction of available materials to admit of a strict rating without introducing inconsistencies."

There has been a sincere, earnest effort made to reach a conclusion on the part of everyone. To adopt a code which on its face would condemn the practical experience and judgment of some of the greatest architects and engineers of this country would defeat the purpose aimed at, yet suggestions along this line have been made. Fundamental data on this subject which will bear critical analysis is still lacking. What is still needed is less fiction and more facts.

Drafts of Proposed Standards for Symbols Available

Drafts of proposed standards for Graphical Symbols for Electric Traction including Railway Signaling (Z10g5), Graphical Symbols for Radio (Z10g3), and Graphical Symbols Used for Electric Power and Wiring (Z10g2) have been printed by the American Institute of Electrical Engineers and may be borrowed for review from the ASA office.

The draft on electric traction is the first proposal circulated on this subject by the committee. The present proposals for Graphical Symbols for Radio and for Graphical Symbols Used for Electric Power and Wiring are revisions of drafts previously issued.

The symbols have been prepared by subgroups of the Subcommittee on Electrotechnical Symbols, Sectional Committee on Scientific and Engineering Abbreviations and Symbols (Z10).

The A.I.E.E. is sponsor, with the American Association for the Advancement of Science, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education, for the committee.

Correction

Two articles on the Safety Code for Walkway Surfaces (A22), "Fatalities Due to Falls Show Need for Walkway Safety Code," by C. W. Burke, reprinted from the *National Safety News*, and "Safety Magazine Asks for Early Completion of Safety Code for Walkway Surfaces" reprinted from *Safety Engineering*, were published in the December issue of the ASA BULLETIN.

As the result of an error in the paging of the issue a portion of the article "Fatalities Due to Falls Show Need for Walkway Safety Code" by C. W. Burke was published as part of the second article "Safety Magazine Asks for Early Completion of Safety Code for Walkway Surfaces."

The paragraphs in the second article beginning on page 8 with the sentence "To avoid slipping hazards, it must be borne in mind that all walkway materials are not suited for use under all conditions and great care must be exercised in selecting the proper material for each specific installation" and continuing through the paragraph on page 9 ending with the sentence "For, in the final analysis, hazards must be removed if serious casualties are to be prevented, and the prevention of the hazard is the only sure and permament cure," should have been published as a continuation of Mr. Burke's article which was concluded on page 7.

Noise Measurement Project Recommended to ASA

The organization of a sectional committee on noise measurement under the procedure of the American Standards Association was recommended by a general conference held in New York on January 29. It was also recommended that the committee function under the technical leadership of the Acoustical Society of America.

The scope of the project as recommended by a steering committee consisting of Professor Vern O. Knudsen, Acoustical Society of America; E. E. Free, American Society of Mechanical Engineers; P. L. Alger, American Institute of Electrical Engineers; H. R. Summerhayes, National Electrical Manufacturers Association; R. G. McCurdy, ASA Telephone Group; and Dr. Harvey Fletcher, Acoustical Society of America, is as follows:

> Preparation of general standards of nomenclature, units, scales, and measurement in the field of acoustics, with special reference to noise measurements.

The conference followed a request made by the Acoustical Society of America to the American Standards Association to set up a national committee to correlate the activities of various technical and trade organizations which have been attempting individually to set up standards for noise measurement. Eight such organizations now have committees on this subject. It was pointed out that the diverse nomenclature and methods of measurement growing out of these uncorrelated activities were interfering with the progress of scientific work on the subject and that without real national standardization this condition would become worse as different individuals became accustomed to different concepts and terms.

For the present the committee's work will be concentrated chiefly on the standardization of nomenclature, units, and scales. It is believed that further progress in the science of noise measurement is necessary before effective standardization of this phase of the subject can be completed. There is some confusion in the measurement of noise at the present time because of the complex nature of noises, the innumerable different types of noises and their effect upon the ear, and the fact that none of the noise meters yet designed can translate the approximate physiological and psychological effects of noise into definite units of measurement. Dr. Harvey Fletcher of the Bell Telephone Laboratories pointed out at the conference that to the average individual a noise composed of widely separated frequencies is less disturbing than a noise of equal intensity but having components close together in the frequency range.

The following were present at the conference:—H. A. Frederick, Vern O. Knudsen, Harvey Fletcher, representing the Acoustical Society of America; P. L. Alger and K. S. Johnson, representing the American Institute of Electrical Engineers; A. Gordon King, representing the American Gas Association; William Braid White, E. E. Free, R. V. Parsons, Paul Bilhuber, C. G. Worthington, C. B. LePage, Wallace Waterfall, representing the American Society of Mechanical Engineers; L. I. Neale, M. A. Quayle, and R. E. Hess, representing the American Society for Testing Materials; C. H. Sharp, representing the Association of Edison Illuminating Companies; Alexander Maxwell, representing the Electric Light and Power Group; J. O. Lennon, representing the National Association of Fan Manufacturers; L. F. Adams, L. W. Chubb, A. Pinto, and H. R. Summerhayes, representing the National Electrical Manufacturers Association; R. G. McCurdy and A. F. Rose, representing the Telephone Group; B. Dudley, representing the Institute of Radio Engineers; V. L. Chrisler, representing the National Bureau of Standards; C. E. Fraser, representing the U. S. Navy; S. K. Wolf, representing the Society of Motion Picture Engineers; J. O. R. Coleman, representing the National Electric Light Association; William N. Tuttle, representing the Radio Manufacturers Association and General Radio Company; and Theodore Coe, representing the American Institute of Architects.

ASA Approves Standard for Steel Reinforcing Bars

An American Standard for Steel Reinforcing Bars (A47-1932) has just been approved by ASA. The new American Standard gives 11 standard cross-sectional areas for steel reinforcing bars, ranging from 0.05 to 1.56 square inches. Such designation is commonly used for this product, rather than designating a round bar by its diameter or a square bar by its side.

The standard was submitted to ASA jointly by the Concrete Reinforcing Steel Institute and the National Bureau of Standards, as endorsing sponsors. The Institute, which represents a large percentage of the fabricators of steel reinforcing bars, has strongly promoted the establishment of the standard in question, while the Bureau of Standards has published the standard as Simplified Practice Recommendation R26–30.

Copies of the standard are available from ASA at five cents each.

Standard Symbols for Mechanics Approved

Symbols for Mechanics, Structural Engineering, and Testing Materials (Z10a-1932) have been approved as American Standard. The standard consists of letter symbols for 69 quantities commonly used in these fields.

These symbols were prepared by Subcommittee 1 on Mechanics, Structural Engineering, and Testing Materials of the Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Z10). The sectional committee is under the sponsorship of the American Association for the Advancement of Science, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education.

The personnel of the subcommittee which prepared the symbols is as follows: John T. Faig, Ohio Mechanics Institute, *chairman;* R. E. Hess, American Society for Testing Materials, *secretary;* G. M. Braune, University of North Carolina; Thomas E. French, Ohio State University; Bevan Jones, American Institute of Architects; H. B. Luther, University of Cincinnati; C. A. Norman, Ohio State University; P. W. Ott, Ohio State University; A. F. Puchstein, Ohio State University; J. R. Snowball, Portland Cement Association; G. M. Spofford, American Society of Civil Engineers; G. R. Walsh, American Railway Association.

Copies of the symbols may be obtained from the ASA office.

Draft of Standard for Dimensions of Valves

A proposed American Standard giving center-to-face dimensions for three kinds of ferrous flanged valves, namely, wedge gate valves, globe valves, and angle valves, has been released for general criticism and comment and may be borrowed from ASA by any one interested.

The proposed standard covers wedge gate valves in sizes from one inch to 24 inches O.D. (cast iron, for 125 and 250 lb steam pressure, and steel, for steam pressures of 150, 300, 400, 600, 900, and 1500 lb); and globe and angle valves in sizes from one-half to eight inches (cast iron for 250 lb steam pressure, and steel for steam pressures of 300, 400, 600, 900, and 1500 lb).

The draft was submitted in the fall of 1931 to Subcommittee 5 on Face-to-Face Dimensions of Ferrous Flanged Valves of the Sectional Committee on Pipe Flanges and Fittings (B16). It was developed by the Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), one of the sponsor bodies for the work of Committee B16, and was adopted by the MSS to become effective, in so far as its members are concerned, on July 1, 1932. The subcommittee, after considering the draft, decided to have it distributed for general criticism and comment and it has thus been released to industry for this purpose.

Articles on Wood Pole Standards Available

Through the courtesy of the Bell Telephone Laboratories, copies of the following articles which explain the work underlying the American Standard Fiber Stresses and Dimensions and American Tentative Standard Specifications for Wood Poles are available for free distribution in limited quantities:

Ultimate Fiber Stresses for Wood Poles *by R. H. Colley* (Monograph B615)

Knot Sizes in Wood Poles *by R. H. Colley and R. C. Eggleston* (Monograph B616)

Standard Dimensions and Uniform Classification for Wood Poles *by R. C. Eggleston and A. P. Jahn* (Monograph B617)

Specifications for Tanks

A revision of its Regulations for the Construction and Installation of Tanks—Gravity and Pressure, Towers, etc., has just been published by the National Board of Fire Underwriters. The regulations are recommended by the National Fire Protection Association. The revision includes specifications for steel gravity water tanks, for steel towers, wooden water tanks, foundations, pipe connections and fittings, valve enclosures and frost protection, tank heating equipments, and pressure tanks.

Standard for Cedar Shingles

The Commercial Standard for red cedar shingles (CS31-31), recently issued by the National Bureau of Standards, has been published and can be obtained from the Superintendent of Documents, Washington, D. C., at ten cents per copy. The standard was established through the efforts of the Red Cedar Shingle Bureau with the cooperation of practically all the cedar shingle manufacturers, as well as many distributors and users.

Proposed Interim Changes of National Electrical Code

Notice has been received from the National Fire Protection Association, sponsor of the National Electrical Code (C1-1931), of the submission to letter ballot of two interim changes in the code.

The first of these changes covers a proposed amendment to paragraph d, section 1402 of the 1931 edition of the Code and is submitted to the members of the sectional committee at the request of Edward F. Caldwell & Company, makers of fixtures, who feel that section 1402d calls for a type of insulation for wires for fixtures which presents serious difficulties to many manufacturers of lighting fixtures. The proposed change reads as follows:

Paragraph d, Section 1402 of Article 14, change to read:

d. Except as provided below, fixtures in dry places and fixtures of weather-tight construction shall be wired with one of the following types of conductors; [*continue table as at present*].

Non-weather-tight fixtures exposed to moisture shall be wired with approved rubber-covered conductors. (See Article 32 for fixtures for use in places where gases may exist.) Fixtures having lamps in the upright position and all fixtures equipped with intermediate, candelabra, and miniature type lampholders may be wired with approved rubber-covered conductors.

The second proposed interim revision covers several paragraphs of the Code and is proposed by the Rockbestos Products Corporation in order to accomplish the recognition of asbestos-insulated conductors in addition to the present recognition of the slow-burning type of insulation. The proposed changes read as follows:

Paragraph h, Section 1701 of Article 17, change to read:

h. Where insulated wire is used for connections between resistance elements and a contact device of a rheostat, except for motor-starting service, the insulation shall be of asbestos-covered (Type A) or of the slow-burning (SB) type.

Paragraph 1, Section 3102 of Article 31. Change the first sentence of this paragraph to read:

Wires between main circuit resistors and the back of control panels shall be asbestos-covered (Type A) or of the slow-burning (SB) type, as prescribed in section 1701, paragraph h, of this code.

Paragraph h, Section 3604 of Article 36. Amend the paragraph so that it will read:

h. Approved asbestos-covered (Type A) or approved slow-burning wire (Type SB) shall be used for wiring the border.

Paragraph d, Section 3903 of Article 39. Amend the first sentence of this paragraph to read:

The common return wire shall not be smaller than No. 14; shall be of either the rubber-covered (Type R), the asbestos-covered (Type A), or the slow-burning (SB) type and shall not be contained in the cable.

The results of the letter ballot on the above proposed amendments to the National Electrical Code will be published in the March issue of the ASA BULLETIN.

American Standard for Threads for Lamp Sockets and Bases

An American Standard for Rolled Threads for Screw Shells of Electric Sockets and Lamp Bases (C44-1931) has been approved by the American Standards Association. The standard covers the dimensions, tolerances, and gages for rolled threads of Edison-type screw shells intended for use in the manufacture of lamp bases and plugs, and of lamp and fuse holders. The dimensions concerned are given for five sizes: miniature, candelabra, intermediate, medium, and mogul.

The standard was set up by a sectional committee organized in 1929 under the procedure of ASA and jointly sponsored by the American Society of Mechanical Engineers and the National Electrical Manufacturers Association. R. E. Myers, chief engineer, Westinghouse Lamp Company, Bloomfield, N. J., is chairman of the committee and A. Brann, engineering department, Westinghouse Lamp Company, is secretary.

The Edison type of base screw shell as covered by the standard has been in use for nearly half a century. As early as 1888 the Edison Lamp Works made socket screw shells in accordance with a gage which differed from the present standard mainly in that it had a slight taper, but the pitch of the thread has remained unchanged from the beginning. An A.S.M.E. standard was laid down in specifications published in 1915 in the *Transactions of the A.S.M.E.* These served as a basis for the work of the sectional committee which resulted in the present standard.

Copies of the standard are available from the American Standards Association at 35 cents per copy.

if you were to test

an ice refrigerator

Would you know how to go about it in a way that would be scientifically correct and that would give accurate and comparable data in a series of tests?

At what points inside the refrigerator would you take temperatures? At how many different points? How frequently would you take readings, and in what relation to the time of re-icing? In what way would you record the ice melting rate? And would you know how to correct the observed data to represent performance at constant room temperature?

All of these are points fully covered in the **Code for Testing Domestic Refrigerators Using Ice** (B38c1-1931) recently approved by the American Standards Association and soon to be available in printed form.

The efforts of makers of mechanical refrigeration appliances during the last two years have greatly increased the use of refrigeration in the home—whether by mechanical means or the ice box. Ten million ice boxes are still in use, protecting the food and health of many more millions of people.

The American Standard Code for Testing Refrigerators Using Ice makes it possible for manufacturers of ice refrigerators to show by actual test, under standard approved methods that are nationally acceptable, the exact performance of any refrigerator.

Copies of the Code are available at 20c each upon request to The American Standards Association.

AMERICAN STANDARDS ASSOCIATION

29 West Thirty-Ninth Street, New York City, N. Y.